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A report of a conference on research in speech and hearing for mentally retarded children is presented. The main areas included are theoretical approaches to language and communication, procedures for measuring language, and special methods for treatment.

Specific reports given are: "Psycholinguistics in the Study of Mental Retardation" by John B. Carroll, "Referential Processes of Speakers and Listeners" by Seymour Rosenberg, "The Relevance of Animal Research" by Jack Michael, "The Development of Communication Skills" by R. L. Schiefelbusch, "Language and Mental Retardation: Empirical and Conceptual Considerations" by Thomas E. Jordan, "Conference on Planning Research on the Mentally Retarded Child" by Joseph M. Wepman, "Procedures for Measuring or Evaluating Language" by Joseph E. Spradlin, "Issues for Speech and Language Training of the Mentally Retarded" by Bernard B. Schlanger, "Language Training for Mentally Retarded Children" by Sylvia O. Richardson, and "The Slow Learner, Grouping Patterns, and Classroom Communication" by Elizabeth Monroe Drews.

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RESEARCH IN SPEECH AND HEARING FOR MENTALLY RETARDED CHILDREN

Report of a Conference at

The University of Kansas

December 2-6, 1963

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PREFACE

The conference was planned by staff members of the Bureau of Child Research with generous assistance from Dr. William Carriker, currently Director of Special Education, Pennsylvania State University. The project should be regarded as an expression of interest by a diverse group of research specialists and also hopefully as a contribution to an area of study which has previously received relatively little conceptual attention.

Special attention should be extended to Dr. Joseph E. Spradlin who helped to write the initial proposal, to Mrs. Dixie Rodkey, who prepared the manuscript for publication, and to the conference participants who interrupted busy schedules to devote a week of intensive effort on the project.

The directors would like also to express gratitude to the U. S. Office of Education for the funds and encouragement to support the project.

RLS
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RESEARCH IN SPEECH AND HEARING FOR MENTALLY RETARDED CHILDREN

CONTENTS

I Introduction 1

II Psycholinguistics in the Study of Mental Retardation 3
JOHN B. CARROLL
Discussion 31

III Referential Processes of Speakers and Listeners 32
SEYMOUR ROSENBERG
Discussion 45

IV The Relevance of Animal Research 47
JACK MICHAEL
Discussion 65

V The Development of Communication Skills 67
R. L. SCHIEFELBUSCH
Discussion 100

VI Language and Mental Retardation: Empirical and Conceptual Considerations. 101
THOMAS E. JORDAN
Discussion 132

VII Conference on Planning Research on the Mentally Retarded Child . . . 133
JOSEPH M. WEPMAN
Discussion 149

VIII Procedures for Measuring or Evaluating Language 151
JOSEPH E. SPRADLIN
Discussion 170

IX Issues for Speech and Language Training of the Mentally Retarded . . . 172
BERNARD B. SCHLANGER
Discussion 183

X Language Training for Mentally Retarded Children 185
SYLVIA O. RICHARDSON
Discussion . . . .

XI The Slow Learner, Grouping Patterns, and Classroom Communication . . 217
ELIZABETH MONROE DREWS
Discussion 241

XII Summary Reports and Recommendations

Subcommittee on Theory 243
John B. Carroll
Jack L. Michael
Joseph E. Spradlin
SEYMOUR ROSENBERG, Chairman

Subcommittee on Speech Development 261
Sylvia O. Richardson
Richard L. Schiefelbusch
GERALD M. SIEGEL, Chairman

Subcommittee on Treatment 267
Ross H. Copeland
Elizabeth Drews
Bernard B. Schlanger
MACK STEER, Chairman

Subcommittee on Measurement 271
Margaret Byrne
William Carriker
Joseph E. Spradlin
Joseph M. Wepman
JAMES O. SMITH, Chairman

XIII Summary of Final Discussion 274

INTRODUCTION

During December of 1963, the Bureau of Child Research, University of Kansas, held its first Research Planning Conference in Speech and Hearing for Mentally Retarded Children.[1] The realized need for such a conference grew from knowledge of the high incidence of communication disabilities among the retarded and the concurrent findings that few retardates receive the benefit of therapeutical or developmental speech and language programs. It was proposed that one apparent reason for the scarcity of speech and hearing services for mentally retarded children is the lack of an organized body of information on which to base highly developed training programs.

It was felt that the information sought must be relevant to the task of preparing the retardate to communicate effectively in society. Consequently, when the conference was planned, participants were sought who would contribute information about the variables affecting communication behavior. Areas from which contributions were originally sought included:

(1) Theoretical approaches to language and communication.

(2) Procedures for measuring language, and

(3) Special methods for treatment.

Among the approaches thought to be productive were neurological, learning, interpersonal learning, and developmental. An additional area was added and labeled "language characteristics and requirements" with the expectation of drawing from linguistics and psycholinguistics.

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[1] This conference was made possible by the support of U.S.O.E.

The five day conference was ultimately built around the presentation of ten papers with consequent discussion. The remaining two days were spent in subgroup deliberation, the preparation and presentation of summary reports. This publication contains each paper prepared for the conference as revised by its author, summaries of the discussion, and the four final summary reports.

In attendance at the conference were Margaret Byrne, University of Kansas; William Carriker, now at Penn State University; John B. Carroll, Harvard University; Ross Copeland, University of Kansas; Elizabeth Drews, Michigan State University; Thomas E. Jordan, Southern Illinois University; Jack Michael, Arizona State University; Sylvia O. Richardson, University of Oklahoma Medical Center; Seymour Rosenberg, Bell Telephone Laboratories; Richard L. Schiefelbusch*, University of Kansas; Bernard B. Schlanger, Ohio State University; Gerald Siegel, University of Minnesota; James O. Smith, now at University of Kansas; Joseph E. Spradlin, Parsons State Hospital and Training Center; Mack Steer, Purdue University; Joseph M. Wepman, University of Chicago.

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*Conference Chairman

Psycholinguistics in the Study of Mental Retardation

John B. Carroll
Harvard University

First of all, I must disclaim any special knowledge or competence in the field of mental retardation. I have never worked with groups of mental retardates, nor have I received any special training in problems of mental retardation. I have come to this conference partly in the hope of informing myself; but at the same time I would like to think that there may be some ways in which I can contribute to the purposes of the conference, first by saying something about the field in which I do feel expert, namely psycholinguistics, and secondly by raising some questions that may be interesting to work with in the study of the language development of mental retardates.

Before coming to the conference, I did make some effort to inform myself about language in mental retardation by checking through various sources, including a bibliography of psycholinguistics which I have been assembling privately over the past two decades. As the result of this survey, I would strongly agree with Dr. Schiefelbusch's remark that research in this area has not been plentiful and that little real progress has been made. Most of the published articles in the area seem to be reports of rather general surveys that do little more than repeat the oft-confirmed finding that difficulties in language and communication constitute one of the major problem areas for mental retardates. Descriptive studies of the language of mental retardates have often been superficial, being restricted largely to reports concerning sentence length, vocabulary counts, and the like.

Some of the most interesting items in my bibliography come from some years ago. For example, Chipman's (1935) study of the vocabulary of mental defectives strikes me as more informative and analytic than more recent studies of vocabulary. Cuatrecasas and Alvarez's (1938) article on syntactical development in mental defectives appears to have explored some problems that have received scant attention since. We seem to know little more in 1963 than we did in 1953 or 1943. Therefore I am gratified to observe the new burst of activity in this field as represented, for example, by the monograph reporting the first results of the Parsons Language Project (Schiefelbusch, 1963).

Actually, what intrigued me about the present conference and impelled me to accept the invitation to attend was the prospect of discussing here some very promising possibilities for using studies of mental retardates to improve our knowledge of child language development in general. In this way we could perhaps develop some notions that would have intellectual and scientific value, and some practical value as well. If there is indeed a language deficit in mental retardation, we need to make a close analysis of this deficit--to determine its nature as precisely as we can. It is here, I think, that we can apply the techniques of psycholinguistics and of linguistics.

Some of the newer ideas in linguistic science, particularly the formalization of grammatical analysis in "generative grammar" by Noam Chomsky (1957), are being tested out in application to language development in normal children.*

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*The interested student can find leads into the relevant literature through use of publications of the writer and his associates (Carroll, 1958 b, 1959, 1964; Kjeldergaard, 1961).

Among the studies that have already appeared are those by Braine (1963), Roger Brown and his associates (Brown and Fraser, 1963; Fraser, Bellugi and Brown, 1963), and others reviewed by Ervin and Miller (1963). Currently Roger Brown and Ursula Bellugi are following very closely the language development of two normal children. From the protocols they have collected in the natural home situation they find that they can write a "grammar" of a child's speech at a given stage of development. The process is analogous to that which would be followed by a linguistic scientist who goes out to write the grammar of some previously unstudied native language in South America or Africa. The language of these children is developing so rapidly that Brown and Bellugi find they have to write a different grammar for almost every month. Indeed, the pace is so rapid that there is danger of missing some of the more important steps in grammatical development. For example, almost overnight one child learned to insert the verb in such phrases as *I'm tired, Mother is working* where before he had said *I tired, Mother working*. (Actually, these phrases represent two different patterns, and the child learned to insert a form of the verb *to be* at slightly different stages of development.)

It occurs to me, however, that in mental deficiency we might be able to observe a sort of slow motion picture of these grammatical developments. Development would, to be sure, be much retarded; but we might expect at least some parallels with language development in the normal child. Whether there are in fact such parallels is an interesting empirical question; and if there are striking differences between normals and mental retardates in stages of language development, this is something we should know about.

Another thing that intrigues me about language development in mental deficiency is the role of language in the development of thought. We have recently become more aware of the degree to which language structure exhibits mental operations of rather remarkable subtlety. We take for granted such linguistic phenomena as grammatical number (singular and plural), tense (present, past, future, etc.) and mode (declarative, interrogative, imperative, etc.) without noticing the complexity of the mental operations that these imply. For example, in the case of the plural, note that it is a rather large jump, if you come to think of it, from the notion of one card to the notion of more than one card, i.e. cards. To use a plural is in a sense to make an abstraction, for an aggregate is an abstraction. To use a plural is to recognize that a series of stimuli share a group of common properties despite any differences that may exist between them. A child seeing a group of cards--some white, some blue, some gray, some big, some middle-sized, some small, etc.--and calling them cards is therefore exhibiting the result of a fairly complex mental operation. And for him to go on from there to talk about all cards or some cards or a few cards is to exhibit even more complex mental operations, verging upon those with which the logician and the mathematician must operate.

If young children of normal intelligence show these mental processes, it would be even more remarkable to observe them in mentally retarded children.

If we were able to make more careful analyses of the stages in which linguistic phenomena such as these develop, we might have a much better way of indexing mental development. Intelligence tests such as the Stanford-Binet recognize this fact, but fail to provide any really analytic data beyond what can be inferred from their tests of vocabulary.

Finally, there is also the possibility that the mental attainments of mentally retarded children as manifested in language development will reveal themselves as greater than we might otherwise think them to be and that these linguistic attainments can be used as a leverage for other kinds of mental development.

This last statement needs careful explanation. I wish I could present some examples from studies of language development of mental retardates, but since I cannot do this I will give you some examples from some observations I have made of language and thinking in persons of normal or above-normal intelligence. In teaching statistics, for instance, I find that even graduate students have some trouble in acquiring the concept of a continuum or dimension along which things may vary continuously. Associated with this is the concept of variable, that is, a respect in which things may be observed to vary. In teaching these concepts, I point out that in English (or for that matter, in every language so far as I know) we have a certain grammatical phenomenon that encapsulates the concepts of variable and continuum. For we can say, "This tree is tall. That tree is taller than this, and that tree over there is the tallest of them." Tall is the name of a variable--or perhaps we should say *tallness*, or *height*. If we can apply the comparative or superlative degree to an adjective, we have a variable or attribute with respect to which things can vary continuously. Thus, a linguistic phenomenon that people have learned "out of awareness" becomes the key to the conscious understanding of some rather subtle scientific ideas. Perhaps a mentally retarded child who has mastered the formation of the comparative degree of adjectives could in this way be taught the notion of variable and continuum.

Another example is also from the field of statistics. I sometimes find that students have difficulty in acquiring and identifying the concept of correlation. They use the word in the wrong sense--for example they talk about the "correlation" of two groups of people, when they probably should talk about "comparison" instead. It happens that the notion of correlation is contained in a rather common grammatical phenomenon in our language (and similar phenomena occur in many other languages). This is the construction exemplified in such statements as *The more I eat, the fatter I get* or *The colder it gets, the more fuel we need*. This construction, with the pattern [*the* (comparative)...*the* (comparative)], implies a correlation between two variables. Amount of eating is correlated with girth; temperature is correlated with fuel consumption. Here again, we have a concept--correlation--that people seem to learn automatically and unconsciously in the process of learning language; by making them conscious of it, we can make them transfer it to various situations where it can be used as a scientific concept.

These are only examples of the many concepts of this sort that are embedded in language and that can possibly be used as leverage for the filling out of gaps in mental development. Whether this can be done with mentally retarded children is an exciting question.

In the introduction to the conference, we were urged to consider various models for language behavior. One model which has been extensively appealed to in recent language studies of behavior of mental retardates is Skinner's model of verbal behavior with its concepts of mand, tact, echoic response, intra-verbal response, autoclitic, etc. (Skinner, 1957). This model is useful for many kinds of investigations, particularly where the concern is with the elicitation and stimulus control of speech and communication behavior. There is indeed much promise in the idea of being able to control and shape verbal behavior by the application of modern concepts of operant conditioning, but this possiblity will be adequately treated, I am sure, by other participants in this conference. The Skinnerian model does not provide the kind of model of language structure that is furnished by contemporary developments in linguistics.

Perhaps it would be of use to define language as linguists define it, and thus to distinguish it from speech, communication, and other terms. For the linguist, a language is above all a system, a code if you will, which underlies the actual manifestation of motor behavior we call speech. According to the definition of language that I worked out at one time in an effort to attain clarity, (Carroll, 1953, p. 10):

> "A language is a structured system of arbitrary vocal sounds and sequences of sounds which is used, or can be used, in interpersonal

> communication by an aggregation of human beings, and which rather exhaustively catalogs the things, events, and processes in the human environment."

When we talk, therefore, about the *language* of mental retardates, we are talking, or should be talking, about the system that they have learned--i.e. what sounds, words, and grammatical patterns they are able to use in speech communication. When we refer to the *speech* of mental retardates, we are referring or should be referring, to the actual behavior of these individuals in using language, the amount of talking, the conditions under which talking is elicited, and so forth. Language is properly defined so as to include only vocal communication, including intonation and accent, but excluding so-called paralinguistic features such as gestures. But insofar as gestures may exhibit arbitrary, conventionalized patterns we may speak of *gesture language*. Speaking, listening, reading, writing, and gesturing are thus names for activities utilizing an underlying language code.

Let us return now to the consideration of the nature of a language code. It is convenient to think of a language code in four distinct aspects:

1. Its phonology--the specification of the units of sound phonemes which go to compose words and other *forms* in the language.
2. Its morphology--the listing of the words and other basic meaningful forms (morphemes) of the language and the specification of the ways in which these forms may be modified when placed in varying contexts.

3. Its syntax--the specification of the patterns in which linguistic forms may be arranged and of the ways in which these patterns may be modified or transformed in varying contexts.
4. Its semantics--the specification of the meanings of linguistic forms and syntactical patterns in relation to objects, events, processes, attributes, and relationships in human experience.

This model of language, it seems to me, should be given appropriate attention in research on the development of language in mental retardation. Studying sentence length is studying speech, not language; studying the development of noun and verb inflections and of syntactical patterns, however, is studying language. Furthermore, the study of language development should take advantage of the findings of linguists regarding the basic elements of a language system, rather than assuming that any native speaker is automatically aware of the proper analysis of these patterns or rather than ignoring the problem of analysis completely.

There is evidence (Lewis, 1951) that in normal children, among the first elements of language to be comprehended are certain basic intonation patterns indicating questioning and other elementary communications between adults and children. We ought to find out to what extent these intonations patterns are functional among children that are so mentally retarded that they do not otherwise speak and at what stage they develop in other mentally retarded children.

I gather from a review of the literature on the language development of mental defectives (Spradlin, 1963b) that considerable effort has been spent on studying the development of phonology in mental defectives--both in terms of discrimination (reception) and articulation (production). Nevertheless, I get the impression that attention has been focused more on "errors" than on norms of development. Despite the availability of the extensive work of Templin (1957), critically reviewed by Ervin (1958), we do not have really adequate information concerning the development of speech sound discrimination and production even for children of normal intelligence. I doubt, therefore, that there yet exists for mental retardates information which is properly based on modern linguistic concepts. For example, Jakobson (1941) has put forth certain notions concerning the order in which distinctive phonemic features are learned by normal children. Berko and Brown (1960) report that very little progress has been made in testing these notions in the case of normal children. It would be of interest to test them in the case of mentally retarded children.

Likewise, very little progress seems to have been made in the study of the morphological development of language in mental retardates. At what point does a child with a given rate of language development start to form plurals of nouns, form past tenses of verbs, or add the -s morpheme to indicate third person singular of verbs in the present tense? Some of the psycholinguistic research methods developed by Berko and Brown (1960) could be used to make comprehensive studies of these questions.

One of the more exciting developments in contemporary linguistics is the advent of what has been called generative grammar. Generative grammar utilizes a number of ideas that have been around for a long time and never before been formalized as a complete linguistic theory. Credit must go to Zellig Harris (1957), Noam Chomsky (1957), and Robert Lees (1960) and others for stating in an elegant way a program for the analysis of language.

I find it convenient to explain generative grammar as a kind of psycholinguistic theory. Generative grammar presumes speech behavior to be guided by a series of implicit behavioral decisions. These decisions are selections of linguistic elements--words, grammatical elements, and syntactical patterns. These decisions generate speech. The study of language as a system is thus really the study of the elements of the language system that are available for choice and of the interrelationships and the consequences of those choices.

For example, when I start uttering any sentence whatsoever, it is as if I had first to decide the basic form of the sentence--whether, for example, it is to be a sentence with the form

/Noun Phrase/ + /Verb Phrase/

rather than the form

"there" /Linking Verb/+ /Noun Phrase/

And I have to decide, as it were, whether the sentence is to be declarative, interrogative, or imperative. If it is to be interrogative, for example, I must decide what transformation I am going to employ: a "yes-no" transformation that merely asks for the "truth-value" of a proposition, as in the sentence

Is he doing it today?

or a "Wh-transformation" that asks for some specific detail, as in

What is he doing today?

or

When is he doing it?

In the limited work that has been done so far, it appears that it is possible to set up a certain finite number of basic sentence types and transformations to account for all possible "grammatical" sentences that might occur. In fact, the remarkable thing seems to be that by approximately the age of 6, children of normal intelligence seem to have learned the complete grammatical mechanism of their language that enables them to construe (understand the structures of) any sentence they hear (even though they may not understand all the words, or understand the 'complete thought" of the sentence). The question is, at what rate do mentally retarded children acquire this grammatical mechanism?

Chomsky's generative grammar model implies that language structure can be understood in three phases: phrase structure grammar, transformation rules, and phonological rules.

The _phrase_ _structure_ _grammar_ specifies the basic types of sentences or sentence expansions that can exist before the application of transformation rules.

The _transformation_ _rules_ specify in what ways the basic sentence patterns can be transformed and in what order the rules are to be applied. For example, linguistic analysis discloses, according to Chomsky, that a passive transformation has to be applied to a sentence before a negative transformation. Thus, in order to make the following sentence passive:

The man didn't buy the eggs

it would be necessary to "untransform" it to "The man bought the eggs" before changing to the passive "The eggs were bought by the man" and then to the negative passive "The eggs weren't bought by the man." The suggestion has been made that the child learns various transformation rules in the order in which it is necessary to apply them in the construction of sentences. It would seem that such a process could be more readily observed in mentally retarded children where language development is presumably much slowed down.

The phonological rules specify how a given sequence of words can be articulated. For example, phonological rules permit one to speak the words "did you" as (approximately) "dija", whereas the words "lid you" as in "that lid you bought" could not be spoken, according to the phonological rules, as "lija". It would be interesting to find out the order in which mental retardates seem to acquire such rules.

There are already a number of examples of experimental techniques for studying the existence of certain grammatical patterns and concepts in young children and, presumably, mentally retarded children. Jean Berko (1958) tests children by finding out how they would form the plurals of unfamiliar words (actually, nonsense syllables). For example, she would say, "This is a wug" (pointing to the picture of some imaginary creature). "Now there is another one" (pointing to the picture of two such creatures). "There are two of them. There are two __?__ " Most normal children will form the plural correctly, i.e. /wagz/ (in phonemic transcription). A similar procedure is used in testing the formation of the past tense: "Here is a picture of a man who knows how to spow" (pointing to a picture of some fanciful activity) "Today he is spowing. He did the same thing yesterday. What did he do yesterday? Yesterday he __?__ ". She has even tested for more complicated grammatical phenomena like the comparative degree of adjectives that I mentioned earlier in another connection. "This dog has quirks on him (pointing to a picture of a dog with a few spots). This dog has more quirks on him. And this dog has even more quirks on him. This dog is quirky. This dog is __(quirkier)__. And this dog is __(quirkiest)__."

Brown (1957) developed a test for the child's recognition of the use of determiners to indicate the form class of words. In one of his tests, for example, he showed the child a picture of a bowl of something that looked like cornflakes or confetti being stirred or kneaded by a pair of hands. Depending upon whether he said "This is a latt" or "This is some latt" or "This is latting" he would expect the child to choose the appropriate picture from three that showed, respectively, a bowl-like object, a pile of material like cornflakes, or a hand kneading something.

We could also study the development of transformation rules. Lenneberg, Nichols, and Rosenberger (1962), as a matter of fact, have been studying the development of transformation rules in mongoloid children. Their technique is to present sentences that the children are asked to repeat immediately. The sentences are of various degrees of complexity and thus exemplify various grammatical transformations. For example, the sentence Peter wants a lollipop and so does Johnnie is a fairly complicated transformation of the two sentences Peter wants a lollipop + Johnnie wants a lollipop. The assumption is made that if a child cannot repeat a sentence accurately he has not properly mastered one or more of the transformations that it exemplifies. By the analysis of a child's ability to repeat sentences of varying degrees of complexity, it is possible to infer which transformations have been mastered and which have not. The evidence suggests that transformations are mastered in much the same order in which it is necessary to apply them in the linguistic analysis of sentences.

Working within the framework of a linguistic model would, I hope, counteract the common tendency to assume that the acquisition of language is a matter of acquiring words. This assumption seems to have underlain many research studies where much effort has been expended on simple word counts, completely ignoring the interesting ways in which those words are or are not patterned. Linguistic and psycholinguistic theories suggest that the primary unit in language behavior is the sentence frame--or more generally, the utterance frame: the pattern in which the parts of an utterance fit.

The notion of an utterance frame can be applied as soon as the young child or the mental retardate starts making utterances that have more than one word. Even the two-word utterances of a young child seem to have a grammar of their own, as Braine (1963) has pointed out. They pattern themselves either on an AX or an XA model, where A stands for some fixed word and X stands for some class of words that can go together with A. For example, a child might ring the changes on the AX model "Where X?" by saying "Where Sammy" "where dog" "where ball" etc. In the XA model he would vary the first word, as in "Push Sammy," "Pull Sammy," "Hit Sammy," etc.

In studying language development from the standpoint of semantics, we should bear in mind that nearly all grammatical and lexical phenomena in language represent what are ordinarily called "concepts." A concept may be defined as an implicit representation of a class of experiences. Many concepts have names. "Dog," "animal," "living thing" "life" are a few names of concepts,--some of them, like "life", extraordinarily difficult to define or describe in any precise way. Presumably concepts can be ordered in terms of difficulty--perhaps in terms of the number of attributes which define them and the complexity of their relationships. The normal child seems to have little difficulty in acquiring a rather extensive range of concepts quite early in life--at least, one would judge so from studies of the vocabulary development of normal children. Study of vocabulary and concept development in mental defectives would perhaps reveal more of the fine structure of ordinary concepts than is possible with normal children.

There are many interesting things going on in the study of the semantics of language development in the normal child. Studies of word association (Ervin, 1961; Carroll, Kjeldergaard, and Carton, 1962; Palermo and Jenkins, 1963) could be replicated with mental retardates, and techniques for administering Osgood's semantic differential (Osgood, Suci, and Tannenbaum, 1957) to these children could doubtless be worked out.

I have been particularly interested in what may be called the semantics of grammatical transformations. For example, suppose we ask the question: what are the psychological antecedents or stimulus conditions that evoke a declarative sentence in contrast to an interrogative sentence or an imperative sentence? If you want something, you can ask for it in several ways--for example, "I want some milk," "Do you have some milk?" or "Give me some milk." It turns out (Carroll, 1958a) that the stimulus conditions that determine the selection of these transformations include such variables as: (1) the speaker's perception of the relative amount of information possessed by himself and by his hearer; (2) the speaker's perception of the willingness of the hearer to accede to his request; (3) the speaker's perception of his social status relative to that of the hearer; and (4) the speaker's perception of whether an act is to be performed for his own benefit or for the hearer's benefit. Thus, the stimulus conditions are indeed situational.

Knowledge of these things may have some practical application in the language training of the mental retardate. If the mental retardate has a communication problem, perhaps it is because he has not been sufficiently trained to choose an appropriate sentence type for a given situation. If we use a reinforcement model for the analysis of verbal behavior, perhaps the unit of response that we need to work with is first of all the sentence type or the transformation thereof--for example, the choice between a declarative and an interrogative sentence. If we were teaching a computing machine to talk, we would have to start with such simple things; and the same may be true for the mental retardate. We could go on to teach the choice between various types of question transformations--the binary ("yes-no") question versus the multiple-response ("wh--") question, these being quite different in structure.

I would like to make a few remarks about methodology. Many of the kinds of things that could be investigated in the speech of mental retardates would require extensive protocols of speech behavior. Preferably, speech behavior should be sampled longitudinally for individual children. In my brief survey of the literature I could not find any satisfactory protocols of the speech of mentally retarded children. Perhaps I did not know where to look.* If such protocols were available and I had the time, I would be interested in trying to infer the degrees of linguistic mastery exhibited by given children at given times. My analysis would seek not so much to index the "degree" of mastery as to delineate in detail what patterns had been mastered by the child, and in what order. Because of the voluminousness of verbal behavior, one would give some attention to the possibility of making analyses of language structure by high-speed computing machine, as in a procedure devised by Klein and Simmons (1962).

The work of Brown, Berko, and others suggests that progress can also be made by the development of special tests for the presence or absence of various aspects of language development. There is the danger of testing too many things at once, however, and thus not being able to infer exactly what behavior the individual has mastered. As I looked over the Parsons Language Sample (Spradlin, 1963a), I felt that while the test might be useful for certain purposes, the tasks presented were far too complex to make possible any useful analysis of language mastery from a linguistic standpoint. Even from the standpoint of the Skinnerian model that avowedly guided development of the test, I wondered whether there was too much complexity. For example, in testing for "mands" the examiner must tell the child what to do; and therefore something beside "mand" behavior is being tested, i.e., the child's comprehension. Perhaps we would have to conclude that it is actually impossible to test for the presence of one given response and only that response, but I am not ready to be pushed to that conclusion. In the Parsons Language Sample there is far too little attention paid to what may be called the discrimination testing paradigm, i.e. the testing of whether the child can discriminate or respond differentially to two contrasting stimuli. I would recommend that in developing language tests, one should establish the discriminative behavior of the subject as a baseline before productive behaviors are tested. Some of the techniques recommended by Lado (1961) for the testing of foreign language competence might be applied in testing the linguistic competence of mental retardates.

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*In the ensuing discussion it was brought out that Gerald Siegel could make available voluminous protocols of the speech of mental retardates collected in a variety of situations and at different ages.

I shall probably have occasion throughout this conference to offer various suggestions as to ways in which linguistics and psycholinguistics can be applied in studying mental retardate speech. I would like to throw out one suggestion here and to amplify it in an appropriate way. I feel that we need to have much better information about the imitative, "echoic" capacities of the mental retardate and his ability to "store" and retain verbal material. I have already mentioned Lenneberg's use of echoic behavior as a means of investigating grammatical capacities of mongoloid children. The imitative capacities of the mental retardate could also be studied from the standpoint of information load. There is evidence in Brown and Bellugi's current work with normal children that sentence generation is constrained, not only by the sentence patterns and transformations that have been learned by the child, but also by some upper limit to the sheer number of units that can be handled at any given age level. Precisely how this works has not yet been studied in detail; but a rough idea is perhaps conveyed by the observation that a child may utter a sentence with either the subject noun phrase expanded to include a modifying adjective or the object noun phrase so expanded, but never with both subject and object noun phrases expanded. This is reminiscent of Yngve's (1960) hypothesis regarding the maximum constructional "depth" of sentence patterns--the hypothesis that would presumably account for the fact that we don't ordinarily let ourselves get tangled up with sentences like "The car that the man that we told to buy a boat brought won the race." Presumably the constructional depth available to mental retardates is more limited than that available to people of normal intelligence.

A further stage in this kind of analysis would be that of studying the storage of memories after varying periods of time delay. The sort of storage I have in mind is exemplified in some of my work with individuals with poor aptitude for learning foreign languages. One of the most predictive subtests in the Modern Language Aptitude Test (Carroll and Sapon, 1959; Carroll, 1962) is what I have called the Phonetic Script test. This is a test in which the individual has to learn associations between sounds, that is, phonemes, and representations of those sounds in a phonemic transcription. At one time I thought the critical element in this test was simply the ability to make the tie or connection between sounds and visual symbols, but in further speculation and experimentation I finally arrived at the idea that what is critical is the ability to store phonetic information in such a way that it is, as it were, identified or tagged. Further, I found more or less by accident that people who get low scores on this Phonetic Script test are also very poor at the task of repeating nonsense syllables after a short time delay filled with other activity. These people can do satisfactorily in repeating (echoing) an auditory stimulus like a pair of nonsense syllables immediately, but if they are asked to do ten seconds of mental arithmetic after hearing the auditory stimulus and then to echo the stimulus, (unlike people of high language aptitude, who have no trouble with this task), they cannot do so. The auditory image has been wiped away, and they have apparently not been able to "store" the original stimulus in memory in such a way that it can be recalled. I wonder how mental retardates would do with such a task because I recall that it has been asserted (Woodrow, 1917; Smith, 1959) that the mental retardate is not so much deficient in actual capacity to learn as he is deficient in the capacity to retain what has been learned.

Even though something is taught to a mental retardate on one day, there is very little saving on relearning. Thus, the problem of language learning in the mental retardate may possibly be a problem of storage.

I would like to conclude by reading from Eric Lenneberg's paper (Lenneberg, Nichols, and Rosenberger, 1962) a quotation that aptly epitomizes a point of view which is not very different from mine:

> "Whereas mongoloid children like to imitate gestures, they do not have the ability to imitate sentences in a mechanical parrot-like fashion. There was no evidence that they learned individual items, e.g., phoneme after phoneme, or word after word, which, one acquired, could be strung together in simple concatenation. Instead, the findings suggest that language development in mongoloid, as in 'normal' children, consists essentially in the application of a very general principle of language. This principle seems to be applied on all levels of complexity. Specifically, it is a principle of perception of patterns and of classification. The patterns are formed by sound sequences and their principle dimension is time. Short trains of sequences are 'stored in bulk' and then operated on in toto. The process is analogous to visual perception except that in visual perception the patterns have spatial dimension.

"In an abstract sense one might say that the basic language phenomenon is present as an Anlage by the time the child stops babbling and further development is merely greater and greater differentiation."

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Discussion Following Carroll's Paper

The first question to the speaker pertained to the experimental edition of the Illinois Test of Psycholinguistic Abilities (ITPA). Carroll elaborated upon Osgood's work and its use as a theoretical base for the ITPA.

Attention was then turned to the reported study concerning mongoloid children. It was felt that clinically defined populations such as mongoloids, cretins, cerebral palsied, etc. do not provide representative groups for the study of mental retardation. The wide variance of behaviors within such groups make them functionally heterogenious. To a degree this observation applies to M/Rs generally as we attempt to derive meaning from group data.

The nature of the language deficit in the mentally retarded was explored next. It was suggested that the language disability might better be understood by analyzing the mental operations of the retardate in some manner similar to Guilford's theorized structure of the intellect (with its operations, contents, and products).

The problems of learning and retention with mentally retarded were briefly considered. Again the various modes of presentation of material in learning experiments and consequent measures of retention were discussed. The differential effect of stimuli presentation upon normals and retardates and the differential recall as a result of this was recommended for further investigation.

Referential Processes of Speakers and Listeners:

A Preliminary Report*

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Abstract

A communication task was developed to investigate processes by which a speaker selects verbal responses in order to distinguish one word (referent) from another (nonreferent). Also studied were properties of the speaker's response that affected the ability of a listener to identify the speaker's referent word. Data from speakers and listeners in this task were linked to word-association norms by means of a stochastic model summarized in the paper.

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*This paper is an elaboration of the presentation Dr. Rosenberg actually made at the Conference. It is currently in press with Science. Dr. Cohen, the co-author of the publication, did not attend the conference.

Referential Processes of Speakers and Listeners:
A Preliminary Report[1]

The set of objects or events about which a person talks, writes, or gestures is termed the referent. The referent has a central role in the psychological analysis of communication (Saporta, 1961, pp. 228-330). Nevertheless, it is difficult to investigate the relationship between a speaker's referent and his linguistic response in ordinary conversation since the referent must be inferred from the speaker's response, itself.

In order to avoid this circularity, a simplified communication situation was developed in which referents were assigned to a speaker (Sp) by the experimenter. A listener (Ls) was given the Sp's response and was asked to identify the Sp's referent. The assignment of the referent by the experimenter made it possible to determine the accuracy with which a Ls identified the Sp's referent.

In the present studies, the Sp and Ls were both shown pairs of words (synonyms), one word-pair at a time. The experimenter designated one word in each synonym-pair as the Sp's referent so that both the referent and nonreferent were, themeselves, words. The Sp was instructed to distinguish the referent word

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from the nonreferent word for a Ls with a new one-word clue, termed *Sp-response*. The Sp was told to use a "clue word that has some understandable connection with" the referent and *not* to use any "clue word that sounds like or is spelled like" either of the stimulus words. Using the Sp-response, the Ls then guessed which word of the synonym-pair was the designated referent.

The present investigation was designed to study the following questions:

1. For a given referent stimulus, what is the linguistic repertoire from which a Sp selects his response?

2. How is the Sp's selection affected by the nonreferent stimulus from which the referent must be distinguished?

3. What properties of the Sp-response affect the probability that a Ls will correctly identify the referent?

Results from an exploratory study of the communication task (sample protocols in Table 1) suggested that these questions could be dealt with by linking classical word-association data with Sp and Ls behavior using the theory described below.

Theory - A Sp-response results from the concatenation of two stochastic processes, *sampling* and *comparison*.

1. *Sampling*. The sampling process occurs first. In this process the Sp samples (but does not necessarily emit) a response from a linguistic set I_r associated with referent r. The probability of sampling response i $(i \Sigma I_r)$ is assumed to be equal to the probability that i occurs as a *word-associate* when r is the stimulus word in a standard word-association test. Assuming intersubject homogeneity, these probabilities can be estimated from group norms.

2. Comparison. Comparison always follows sampling. The result of the comparison process is that the Sp either emits the sampled response or rejects it as an inadequate communication. The probability of emitting a sampled response i,

$$P_i \{r,n\} = s_i(r) \,/\, [\, s_i(r) + s_i(n) \,], \qquad (1)$$

where $s_i(r)$ and $s_i(n)$ are "associative strengths" between i and the referent and nonreferent, respectively. Values of s_i are estimated from word-association norms. Equation (1) has been used extensively in paired-comparison problems and is known as the Bradley-Terry Model (Torgerson, 1958). Equation (1) is also derived by Luce (1959) from his choice axiom.

If the Sp rejects a sampled response as a result of the comparison process, he samples again from I_r. If a sampled response is rejected as a result of the comparison process and if the Sp then samples from I_r with replacement of the rejected response, the entire Sp process can be described as a stationary Markov process with transitional probabilities estimated from word-association norms.

Equation (1) also gives the probability that the Ls chooses the referent using i as his clue word. Thus, within the context of this theory, Ls behavior is also relevant to the analysis of the Sp's comparison process.

Experiments - Two experiments were designed to evaluate portions of the general theory, one study pertained to Sp behavior and the other study to Ls behavior. A total of 218 male undergraduates served as subjects: 108 in the Sp study and 110 in the Ls study. In addition, word association data were collected from 544 male undergraduates not used in either the Sp or Ls studies. Two-hundred and seventy-two subjects were given one member from each of 153 synonym-pairs as stimuli; the remaining 153 words were given to the 272 additional subjects. Discrete word-association instructions were used. The Sp and Ls studies are reported below.

Speaker study - Each Sp was given 50 synonym-pairs in one of two orders and was told that his Sp-responses (along with the synonym-pairs) would be given to Ls's at a later date. Synonym-pairs were projected on a screen, one pair at a time, and a Sp was given 25 sec. to write his one-word clue for the assigned referent in each synonym-pair.

The strong empirical relationship between Sp-responses and word-associates is summarized in Fig. 1 (solid line). The points on the solid line in Fig. 1 would be expected to fall along the diagonal if the Sp's process consisted only of sampling. The presence of an additional Sp's process, presumably comparison, is particularly noticeable for the high-probability word-associates where the Sp-response curve (solid line) departs most radically from the diagonal. The comparison process is most apparent for the high-probability word-associates of the referent since, as the dashed curve in Fig. 1 shows, the probability that a word-associate (of the referent) will also occur to the nonreferent is proportionately greater for high than for low-probability associates of the referent stimulus. The net effect is that the low-probability word-associates of the referent are "favored" as Sp-responses. (For the present, the details of the Sp's comparison process, itself, will be studied with Ls's data on the assumption that Ls's choices are the result of the same comparison process.)

From the sampling process assumed for the Sp, it would be expected that, except for sampling error, all Sp-responses to a referent are contained in the word association norms to that referent. To evaluate this prediction, it was first necessary to estimate the reliability of the norms, themselves. To estimate reliability, the group of 272 subjects used in the word association study was first partitioned randomly into two subgroups of 108 (equal in size to the Sp group) and 164. Results based on the norms from 25 stimulus words revealed that 56% (on the average) of the responses of the smaller subgroup were also found among the responses given by the larger subgroup. This value was obtained after deleting those responses which would have been inadmissable as Sp-responses, e.g., the nonreferent word. The average percentage of Sp-responses to a referent that were found among word-associates (to that referent) of the same 164 subjects used to assess norm reliability was 53%...satisfactorily close to the estimated reliability figure of 56%. A perusal of those Sp-responses not found in the norms based on the 164 subjects suggest that most of these responses may be low-probability word-associates which do not occur in norms based on a small sample. The norms based on all 272 subjects, for example, account for 59% of the Sp-responses. As already noted, overlap between high-probability word-associates of synonym-pairs results in proportionately greater preference for the more remote associates by the Sp.

Listener study - Each Ls was given 256 word-triples in one of four orders. Each triple consisted of a synonym-pair and a Sp-response. Subjects were told that Sp-responses had been obtained in a previous semester and that their task as Ls's was to guess which of the two synonyms in each word-pair had been the Sp-s assigned referent. Sp-responses had actually been selected from word association norms in order to control systematically the associative strengths of the Sp-responses given to the Ls's. Word triples were projected on a screen, one triple at a time, and a Ls was given 8 sec. to guess the referent in each case.

Figure 2 summarizes the relationship between Ls's choices and the proportions of times the clue word occurred as a word-associate (using all 272 subjects) to x and to y, the two synonyms in a pair. Figure 2 is analogous to a set of psychometric functions with $P_x(i)$ and $P_y(i)$ as measures of stimulus magnitude $P_x(i) > P_y(i)$.

If we let $s_i(x) = a \quad P_x(i)+c \quad b$, i.e., the power function commonly found for physical continua, and make the appropriate substitutions in Eq. (1), we obtain a linear equation with zero intercept,

$$\log \left[P_i\{x,y\} / P_i\{y,x\} \right] = b \log \left[\left(P_x(i)+c \right) / \left(P_y(i)+c \right) \right] , \qquad (2)$$

where $P_i \quad x,y$ is the probability that a Ls chooses x as the referent in an x-y pair and $P_i \quad y,x = 1-P_i \quad x,y$. Figure 3 is a plot of the empirical relationship between Ls's choice data and word-association data $P_x(i) > P_y(i)$ using the log transformations in Eq. (2) and letting $c = .0018$ (obtained from a modified least-squares procedure). The fitted straight-line has a slope of .700, i.e., the value of b also obtained from the least-squares procedure. The linear fit is particularly good; there is no indication of any systematic curvilinearity in the observed relationship.

Conclusions and extensions. The results of the empirical studies indicated that the stochastic theory described in this paper can provide a satisfactory account of Sp and Ls behavior in the communication task. Sp and Ls theory can be generalized, without difficulty, to studies in which a Sp and a Ls are giveb more than one nonreferent and, possibly, to studies in which nonverbal stimuli are assigned as referent and nonreferent(s). The Ls theory can also be generalized to studies in which Sp-responses given to a Ls consist of phrases and sentences rather than single words.

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Table 1

Sample protocols from an exploratory study with 18 Sp-Ls pairs

REFERENT	NONREFERENT	FQY. SP-RESPONSES							
		A. Low Error Word-Pairs							
gay	cheerful	Ben	1	exhilarated	1	fairy	1	happy	1
		homo	1	homosexual	1	joyful	1	light	1
		liquor	1	lively	1	Paris	1	party	1
		queer	5	wild	1				
alike	equal	exactly	1	likeness	1	look	2	match	1
		hot	1	similar	10	twins	2		
		B. High Error Word-Pairs							
lawful	legal	abiding	1	all right	1	allowed	1	attorney	1
		correct	1	empty	1	justice	1	layman	1
		loophole	1	people	1	policeman	1	regulation	1
		right	1	school	1	unwritten	1	un-	1
		wedlock	1	wife	1				
disappear	vanish	absent	1	act	1	can't find	1	cease	1
		dishes	1	dissolve	1	expire	1	fade	1
		frequently	1	gone	1	hide	1	leave	1
		leave	1	lost	2	magician	1	soapsuds	1
		symptom	1						

Note: If a Ls incorrectly identified the referent for a given Sp-response, the Sp-response is underlined.

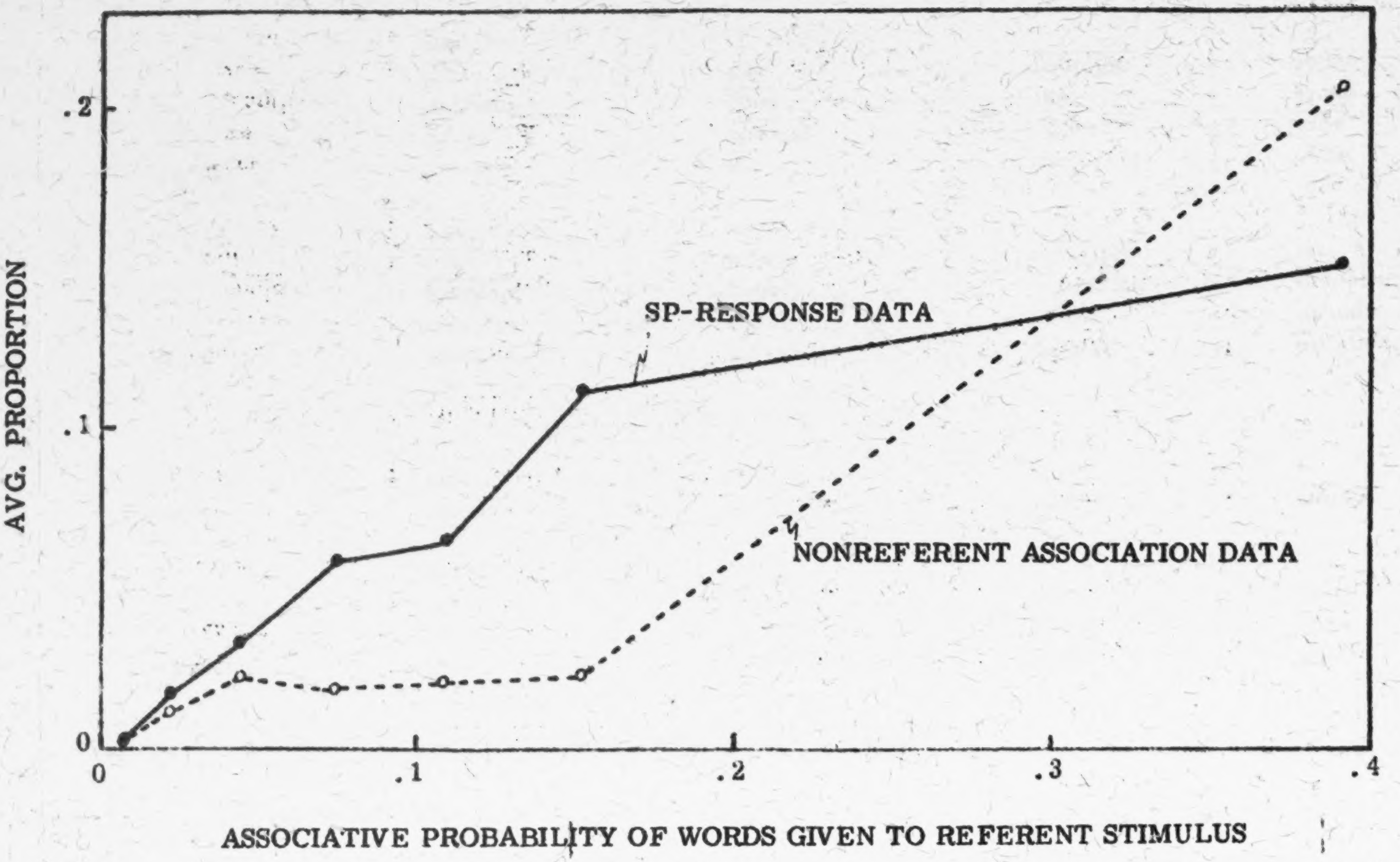

Figure 1 The relationship between the proportion of times that a response word occurred in the word association norms of the referent and (a) the average proportion of times that the same response occurred as a Sp-response (solid line) and (b) the average proportion of times that the same response occurred in the word association norms of the nonreferent (dashed line).

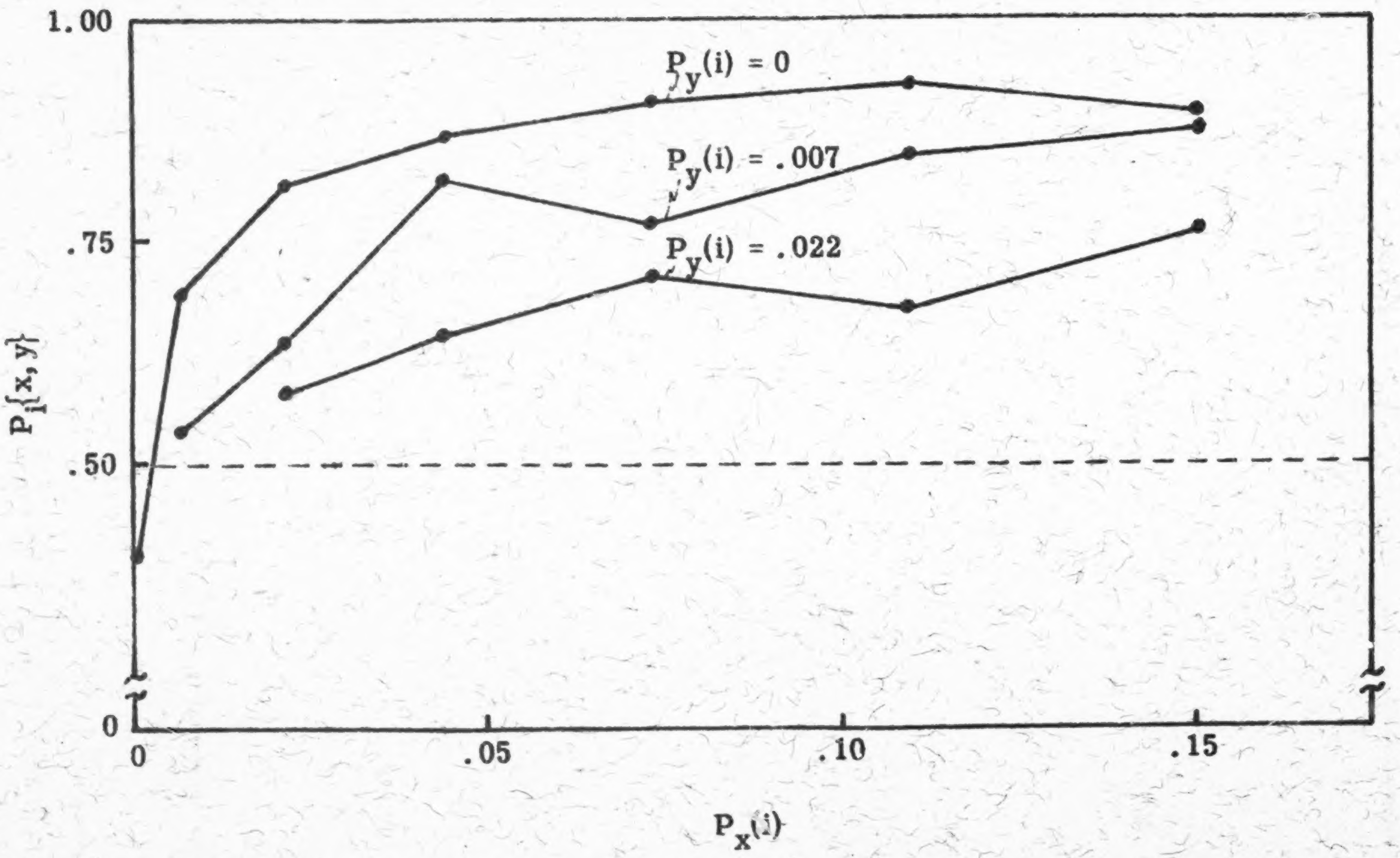

Figure 2 The relationship between word association data and Lss' choice data. $\underline{P}_{\underline{x}}(\underline{i})$ and $\underline{P}_{\underline{y}}(\underline{i})$ are estimated by the proportions of times a clue-word occurred as a word-associate to words $\underline{x}$ and $\underline{y}$, respectively. $\underline{P}_{\underline{i}}\{\underline{x}, \underline{y})$ is estimated by the proportion of Lss who chose $\underline{x}$ in $\underline{x}, \underline{y}$ synonym-pair. Each point in the graph is based on the average of eight different word-triples.

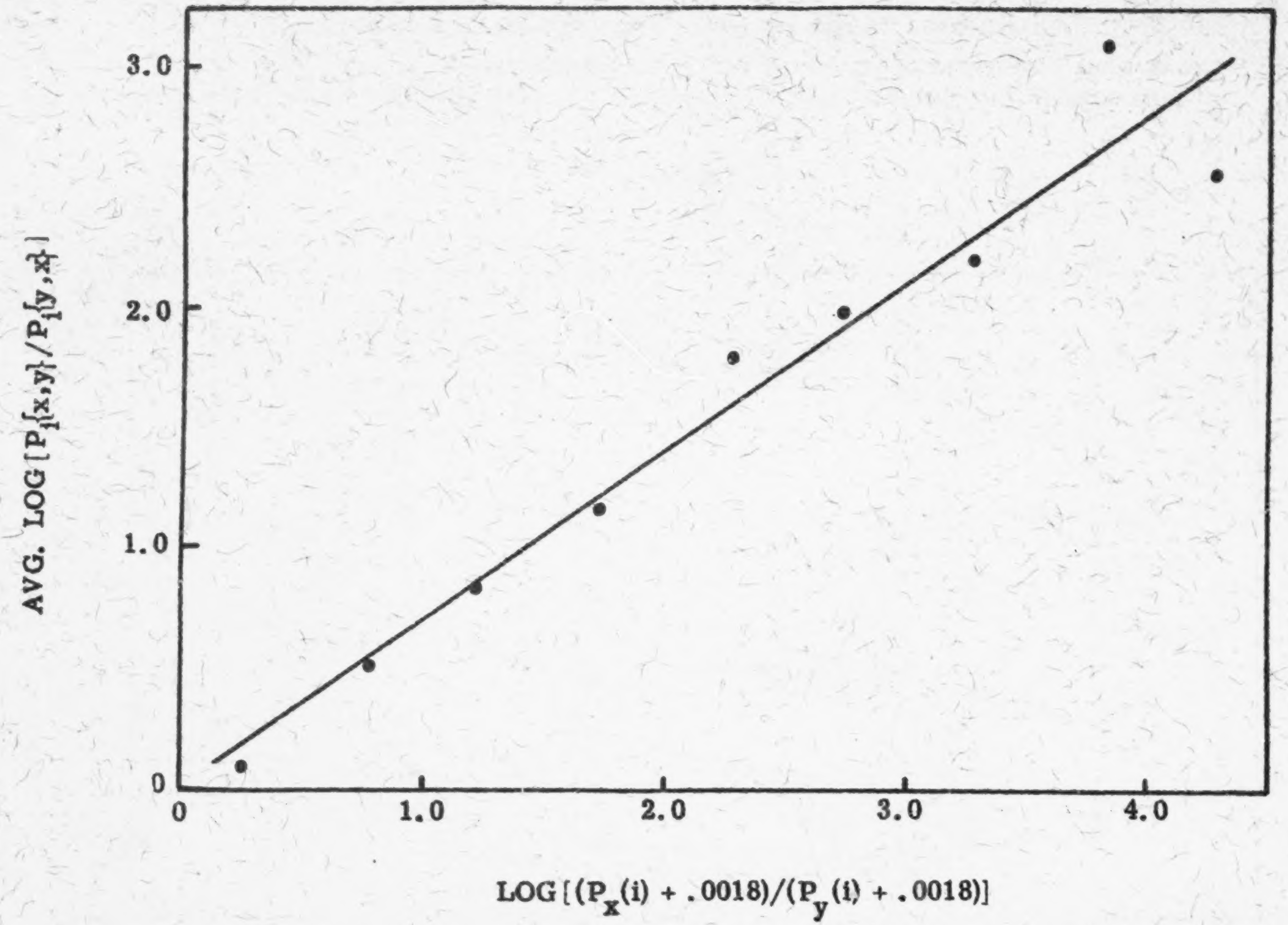

Figure 3 The use of a single-valued function of $\underline{P}_x(\underline{i})$ and $\underline{P}_y(\underline{i})$ derived from the comparison model to relate word association data and Lss' choice data. See Equation (2) in the text.

Discussion following Rosenberg's paper

Initial comments related to the investigator's definition of a speaker's response as "a clue word that has some understandable connection with the referent." It was asked why two word combinations such as "more natural", "all right", "can't find" were accepted. Others questioned the investigator's acceptance of prefixes such as "un-" and proper names such as "Ben" and "Paris". Further time was spent exploring the "rules of the game", the possibility of accepting rhyming words, and other aspects of arbitrary decisions concerning acceptable clues.

Dr. Rosenberg explained the necessity of using speakers and listeners who are unknown to each other. Early pilot work demonstrated that fraternity brothers, friends, husband-wife teams, etc., would often respond with some commonality in the experimental background.

The effect of feedback upon the speaker in other experiments was discussed. Rosenberg told of work wherein negative feedback caused many speakers to increase the amount of language. Here, it was felt, there would be an interaction effect related to certain personality types. For example, some might not be as sensitive to such negative feedback and react more in the fashion, "Well I described this thing, and if he can't understand it, the heck with him."

Other features of this study mentioned included the homogeneity of word pairs, the requisite language usage necessary to produce consequent discrimination and possible effect of non-similar word pairs.

Dr. Richardson mentioned the feedback of one's own production as well as feedback from another as important to this kind of study. She illustrated her comment with the story of the Robot Psychiatrist which was constructed electronically and contained a tape recorder. This robot was set so that when the speaker talking to it paused a few seconds, the tape recorder would play back part of or all of his last sentence. Here, it was noted, that within a short period of time most subjects began to argue with the robot, making such comments as, "No, that isn't what I meant."

It was also suggested that studies similar to Rosenberg's be analyzed by method of input and output. Are the stimulus words spoken or written, and does the individual respond into a recorder, to another person, or does he write or underline an answer? The particular method used was held by the discussants as important in relation to interpreting the findings.

Dr. Wepman discussed a study where every eighth word was eliminated from taped recordings of aphasics' speech. The normals and aphasics were asked to listen to this tape and to supply the missing words. He reported that normals invariably were able to select the correct form or slot the word correctly with little difficulty. Aphasics appeared almost totally incapable of this, having difficulty even selecting the same form class.

The Relevance of Animal Research

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For several reasons, it is important to begin this presentation with some disclaimers. It would be a serious mistake to view the retarded human as in some way more similar to a lower animal than is the normal human and to develop an interest in animal research for this reason. Such an approach can be maintained only as a result of a very superficial analysis of the behavior of the mental retardate. Neither does the major contribution of work with lower animals derive from the fact that we can, without serious moral qualms, provide lower animals with artificial brain damage and study the effects of such damage on their behavior, although this is not an unprofitable line of inquiry. And, finally, we cannot expect much help in efforts to understand language and language difficulties in the retarded from attempts to provide some form of language to lower animals or to study naturally existing behavior that resembles human language, although, again, such investigations are not without significance.

The main value of animal research for the topic of the present conference is more indirect. Twenty years of intensive work with lower animals, primarily rats and pigeons, has resulted in a rich assortment of techniques, concepts, and principles whose relevance extends to the behavior of all organisms. Much of the technology of the animal laboratory can be applied almost without modification to the problems of research in mental retardation, and the principles of behavior that have developed in such laboratories are being put to work increasingly to explain mental retardation and to remedy it. As illustrative of this general approach, I should like to consider three points of contact between the area of animal research and the topic of this conference. The first concerns the relative ease or difficulty of different kinds of behavior. The second concerns motivation and reinforcement variables, and the third is a report of some new discoveries in the area of stimulus control.

1. Evaluation of behavioral accomplishments

My first contact with mentally retarded children was on a research project in which Lee Meyerson and I collaborated in the development of an operant conditioning technique for testing auditory sensitivity. The procedure that proved most effective was one in which the subject sat before a panel containing two levers, above each of which was a light. The auditory stimulus was sounded either through headphones or through a loudspeaker in the ceiling. The subject first learned to operate the lever on his right and was reinforced intermittently by the delivery of trinkets, candy, etc. into an open pan located between the two levers. The schedule of reinforcement was variable ratio 8. During the time the child was learning to operate the lever on his right, a loud tone was played through the sound system and the light above the right lever was on. Eventually, the tone was silenced, the light above the right lever was turned off, and the light above the left lever was turned on. At this time, pulling the left lever paid off on the same variable-ratio schedule that had prevailed on the right lever.

Responses on the right lever were now not reinforced at all. These two conditions were then alternated. The children quickly learned to follow the light, that is, to operate the lever beneath the illuminated light. If the subject could hear, the tone provided an additional cue for correct responding. If the tone was on, the child could receive reinforcement for operating the right lever. If it was off, operation of the left lever was reinforced. The equipment was programmed so that simultaneous operation of the levers was never reinforced nor was rapid alternation between the two levers. After the child learned to follow the light, it was gradually faded out, leaving only the tone to control responding. The tone was then attenuated gradually and an evaluation of auditory sensitivity was thus provided. Two to five half-hour sessions were usually sufficient to provide sensitivity measurements for a series of eight tones.

When I first described this procedure to interested parents, teachers, and specialists in the field of retardation, I encountered what at that time struck me as a curious misunderstanding. We were using as subjects a heterogeneous group of trainable retardates ranging in age from seven to nineteen years. In general, the adults who had contact with these children were confident that the children could not perform the task. The most frequent comment was, "He will not be able to understand what you want him to do." To those of us who work with lower animals, this pessimism seemed completely unwarranted. The procedure we used was a modification of a relatively common technique for studying stimulus control in rats and pigeons. Most of these children had some speech, dressed themselves, followed verbal and gestural directions, all of which are as complex as the two-lever discrimination of our audiometric testing situation.

Since that time, I have frequently encountered variations of the same misunderstanding. A very common example is the belief that various kinds of intermittent reinforcement will "confuse" the mentally retarded subject and that, as a result of the confusion, he will be unable to respond. Another is the notion that even simple forms of vocal behavior, such as naming objects, require some very special higher intellectual ability not found in lower animals and likely to be deficient in the retarded.

The basis of this misunderstanding seems to involve the assumption that most learning takes place by processes requiring an ability to verbalize the requirements of the learning situation or to profit from verbal instructions. If such were true, of course, non-verbal organisms would learn very little, and perhaps this is in keeping with the erroneous view of many laymen that most of the behavior seen in such organisms is instinctive.

Unfortunately, it is not only the layman who has trouble evaluating the relative difficulty of different kinds of behavior. Educators, psychiatrists, neurophysiologists, and even psychologists whose special interest is human learning often find this an impossible task.

A familiarity with current developments in lower animal research will not by any means solve the problem; but it should, at least, prevent gross errors since it is in this area that the problem of building behavior from very simple components is directly dealt with. In much human research on learning, the subject's repertory at the start of the experiment contains many components which contribute in unknown but considerable degree to the experimental task. Also, if the experiment lasts over several days, the activity engaged in outside of the experimental setting contributes a further unknown factor, often not of minor significance. Said another way, when a psychologist develops a complex form of behavior in a human subject, his explanation of how he did it could be quite wrong in spite of the fact that the behavior was, indeed, produced. This is less true in the case of an animal subject, and as a result the explanation given by the experimenter should be more valuable to us.

To return for a moment to the evaluation of the relative difficulty of language behavior, there is a fairly common kind of deficit which seems especially amenable to more intensive training efforts. Some children make a wide variety of sounds, but do not use these sounds as a form of functional language. There is no behavioral reason why such sounds cannot be made functional and rather quickly if the environment is such that important events are contingent on the occurrance of those sounds. This is just ordinary operant behavior, no different in underlying behavioral principles from other operants such as reaching for things, walking, operating door knobs, etc.

Furthermore, making several different sounds under the control of different stimuli is identical in principle to making different motor responses of a non-vocal form in the presence of different stimuli, such as operating one kind of door knob with one motion and a different kind with a different motion.

If the speech musculature or the relevant motor region of the brain is damaged, then vocal behavior may be uncontrollable. However, this possiblity should not prevent the development of normal verbal behavior (in Skinner's sense) using some other musculature. This could be a form of gesture or sign language, but better yet, would be a mechanical device which makes speech sounds and can be operated with the hands. The engineering problems could probably be solved rather easily for the price of a jet plane or two. A beach ball device which emitted squeaks and moans and various sounds when squeezed in various ways would suffice. It might take years to learn to work it effectively, but so does our vocal musculature. The advantage of this kind of substitute for ordinary speech is that the user could produce a stimulus which ordinary listeners could react to. Special training in sign language or code of some sort would not be required.

In summary, then, one major value of animal research findings and methods to those concerned with language learning in the mentally retarded is to provide a basis for the analysis of behavior into its components and for the assessment of the difficulty of these different components.

2. Importance of reinforcement variables

In animal research which results in the production of complex behavior, the subject is usually placed on a regimen of systematic food deprivation and given small amounts of food as a reinforcer. During training he is kept in an enclosure which reduces the effect of uncontrolled outside stimulation. The enclosure contains the

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feeder mechanism, the response apparatus, devices for presenting stimuli, and little else. Programming of stimuli and reinforcement contingencies is accomplished automatically by electronic equipment since human programers lack sufficient patience, accuracy, and speed for the task.

These procedures are in striking contrast to those used in remedial and research work involving the mentally retarded. Fortunately, the automatic control that can be used in mental retardation is primarily a matter of engineering developments and sufficient financial resources. An increasing number of research establishments use such methods.

A much more difficult problem is the discovery or development of an effective reinforcer. The reinforcers usually available to the mentally retarded learner are social approval, advancement in some series of learning tasks, candy or similar non-essential edibles, trinkets and toys of various kinds, and escape or avoidance of mild social disapproval or other aversiveness. The reinforcing effectiveness of these events for a particular child is often not known and in any case varies from moment to moment. Furthermore, these are not the kind of events which will maintain intense work for a number of hours per day for many days, and intensive work may well be what is required to overcome some deficiencies. Until this problem of effective, long-term reinforcement is solved, the true potential for recovery from mental retardation cannot be evaluated.

In the case of institutionalized children whose mental age is 3 years or more, a possible solution is the development of a comprehensive, token reinforcer system. This is a system in which as many of the institution's reinforcers as possible are obtainable only through the exchange of tokens, which in turn are obtainable only as reinforcement, contingent on behavior that the institution wishes to develop or maintain. The tokens could take a variety of forms, with the main requirement that the child be able to retain some record of his "wealth" so that he can observe progress toward various goals. Coins and paper money, such as the tokens of our own adult world, are not the most convenient form since they can be lost or stolen. A card which the institutional representative can mark or punch holes in or a booklet in which stamps of some sort can be pasted is a safer form of token.

Tokens are already used in many educational settings; but most often they are related to fringe benefits such as a special prize which only one child can win, or they are symbols of educational accomplishment not redeemable for anything other than social approval. Such fringe benefits are no more durable or generally effective than the reinforcers already available and would not be expected to maintain prolonged and effortful remedial work.

The value of the ordinary adult token, money, is due to its relative lack of dependence on momentary conditions of deprivation or aversive stimulation. It functions as a reinforcer in maintaining long hours of productive work because it is exchangeable for many different kinds of positive reinforcers and purchases escape from or avoidance of a wide variety of aversive conditions. It is seldom the case that none of these motivating conditions are in force.

To produce a comparable token for the institutionalized retardate, it will be necessary to set up a culture in which most of the good things in life are purchased with tokens, and many of life's inconveniences are avoided or escaped by payment of tokens. For example, special foods, desserts, entertainment in the form of movies, trips, participation in games, special toys, trinkets, more comfortable living conditions, and special kinds of attention from adults should all be available for a price. Also various inconveniences such as being required to move from a familiar living condition to an unfamiliar one, being required to wait for certain kinds of reinforcers, and so on should be avoidable by payment of tokens. In such a culture, tokens would become powerful reinforcers and could be used to maintain long periods of intense educational activity.

The most common objection to this kind of suggestion is an emotional and moralistic one. Isn't it inhumane to make such demands of individuals who are handicapped when we don't make them of normal children? Children should be out playing, having fun, etc.; and, to withhold something from a child that he wants badly until he engages in some educational activity is cruel.

The next most common objection is that it won't work because it requires a certain amount of intelligence and years of training to function well in a monetary culture, and even normal children don't become effective with money -- "don't learn the value of money" -- until they are practically adults.

A detailed answer to the belief that deliberate programming of most of the child's reinforcement contingencies is in some way immoral would take us too far afield. However, it may help to point out that what I am not suggesting is the establishment of harsh contingencies which the subjects must meet or do without reinforcements. In an effective token culture, it would be considered highly undesirable for anyone to fail to receive a great deal of reinforcement. A child who is not receiving a heavy dose of reinforcement is a child who is not learning anything, a situation calling for immediate relaxation of requirements followed by a more gradual subsequent advancement.

The fact that normal children do not acquire effective behavior regarding money until they are fairly mature is not as relevant as the fact that chimpanzees do acquire a rudimentary form of token behavior when provided with special training. The only token that most children are exposed to is ordinary money, and it is not usually convenient for parents to involve young children in their (the parents') own token system; consequently, most children receive very little early or intensive training with such a system. However, there are enough cases of parents who have developed special token systems for their children (usually to maintain cleanliness and order) and cases of special institutional environments involving tokens to assure us of the feasibility of such a plan.

Although it does not bear directly on the suggestion of a token culture, any suggestion regarding more prolonged and intense training for the mentally retarded often meets with the notion of the limited attention span of such subjects. This is a concept usually brought in after the fact to explain a failure to maintain behavior. It has no parallel in lower animal research. Any failure on the part of a lower animal to maintain some activity for as long as the experimenter desires is considered an example of lack of control over the relevant variables. Most cases of short attention span in the mentally retarded that I have observed are cases of weak reinforcement for the desired activity and available reinforcement for other activities. There is no reason to suppose that the mentally retarded will show a degree of persistence in reinforced behavior less than that of rats, pigeons, and normal humans for that matter.

While an institutional culture based on a comprehensive token system of reinforcement may facilitate prolonged remedial educational work in some retarded individuals, there are surely some for whom such a system is not possible. These are the children whose only reinforcers are those related to relatively primitive reinforcer-deprivation systems such as food and water and the aversive conditions such as excesses in temperature or painful stimuli.

Because the behavior of such children seems so unamenable to the ordinary instructional methods which rely heavily on verbal behavior, such children usually are given only custodial care. Their behavioral potential cannot be fully appraised until we are able to provide intensive remedial training at a very early age, and this will wait upon our willingness to utilize the primitive deprivation-reinforcer variables within the remedial setting. Although it may seem harsh to require a severely retarded child to obtain all of his food as reinforcement for successive approximation to a verbal repertory, for instance, it could just as well be argued that it is harsh to waste his critical early years. With an effective reinforcer and aid from the field of automation and electrical engineering, and sound reinforcement principles, there is no question that a great deal more could be accomplished with such children.

One final objection to creating well-controlled environments is that it may be possible to develop the kind of behavior we want in our well-controlled setting, but of what use is it since the child must ultimately function in the poorly-controlled everyday human social situation? The answer is that the well-controlled setting may be necessary for the development of a repertory; but once it is developed, it will function in the same way that similar behaviors function in normal individuals. It is hard to believe that a child who has learned to control his social environment through verbal behavior, and is reinforced for doing so, will discontinue this behavior in favor of more effortful forms of control. To the extent that the behavior developed in the remedial setting continues to be reinforced outside this setting, we would certainly expect such behavior to be maintained; and it is our task to be sure that the kind of behavior developed in the remedial setting is exactly that kind which will function well in the outside social environment.

In summary, then, for remediation of many kinds of retardation, it would appear that thousands of hours of intense, effortful, educational activity is required. To say the least, we cannot know how much remediation is possible until we push the time and effectiveness of training to the maximum. To do this, an effective reinforcer is absolutely essential. A comprehensive token culture will provide such a reinforcer for some retardates; for others the only solution may be to use the same biological variables that are used in lower animal experiments. To anyone who has worked with lower animals, the present accomplishments with the retardate seem remarkable indeed, considering the lack of control over the relevant variables. When good control is provided, there seems to be good reason for an enthusiastic optimism.

3. Development of stimulus control

In the preceding section, the maintaining or motivating function of reinforcement was emphasized. But now that we have our subjects putting in a 6- to 12-hour day on educational activity, is there any animal research suggesting improvements in the nature of such activity? There are a number of recent findings which seem to me of considerable significance, but the work which bears most directly on the problems of language learning in the retarded is that of H. S. Terrace on errorless discrimination learning.

Operant responses have traditionally been brought under stimulus control by some variation of the following training procedure. First, the response is shaped and a number of reinforcements are given in the presence of the positive stimulus. For example, a food deprived pigeon is reinforced with a few seconds' access to grain for successive approximations to pecking a transluscent disk (or key) on the wall of his chamber. The key is illuminated from behind with a green light. After he has learned to peck the key and been reinforced a number of times for this response, the color is changed to red. While the key is red, no responses are reinforced. However, the bird responds in this condition almost as readily as in the positive stimulus condition. After the negative stimulus, of S-, has been present for a while, the S+ is presented again; and the pecking response is again reinforced. These two stimulus conditions alternate, with the S- usually being present for a considerably longer time than the S+ since it is said that little further training is needed to maintain a strong response in S+ but much unreinforced responding has to occur in the S-. Eventually good stimulus control develops, in the sense that very few responses occur when the key is red, but when it becomes green the bird pecks it immediately.

The relevance of this to language learning is quite clear. As Skinner has suggested, the vocal behavior of human speakers is all essentially operant behavior under stimulus control, but an especially close parallel to the pigeon experiment described above can be seen in a child's acquisition of vocal responses controlled by features of the environment--the "tact" in Skinner's terminology. The child's vocal response, 'red' is brought under the control of the relevant feature of the environment in much the same way that a pigeon would be taught to peck red keys but not keys of other colors. Of course, the well-developed abstraction would require that other features of the keys, such as their shape, location, etc., become irrelevant; but this is a relatively straightforward extension of the discrimination procedure.

As was indicated above, in the standard discrimination procedure there is a good deal of what could be called erroneous responding, that is, continuing to respond when the S- is present. For difficult discriminations, several hours of extinction are required to reduce this behavior to the point where only one tenth as many responses occur in S- as in S+. Prior to the work of Terrace, these errors were thought to be a critical part of the discrimination process. What he has shown is that excellent discriminations can be developed quite quickly with no errors, and further, that these errorless discriminations show important emotional differences from discriminations developed in the ordinary way.

First, I will describe the techniques of errorless discrimination training in the context of the previous example. There are several features of the procedure which distinguish it from the standard procedure. In the first place, the S- is introduced very early in training, usually after only a few reinforced responses in the presence of the S+. Secondly, S- is at first made to differ from S+ as much as possible. This means that other dimensions of the stimulus than the one on which the discrimination will ultimately be based are changed. In the example of the pigeon learning to peck the key when it is green but not when it is red, Terrace would introduce the S- as a completely dark key, thus differing in brightness as well as color from S+. Additional irrelevant stimulus dimensions also could be added, such as having a buzzer sound during the S- but not during the S+, having S+ flicker, and so on. The result of this aspect of the procedure is that the stimulus change from S+ to S- is so dramatic that the tendency to respond in the presence of S- is at first quite low.

Thirdly, the S- is presented only briefly at first. This is exactly opposite to the standard procedure.

The final feature is the gradual elimination of the irrelevant stimulus differences and the gradual increase in duration of S-.

As a result of these procedures, responses simply are not made to S-. In the present example, the completely dark key is slightly lighter and greener at each presentation and remains present for longer and longer periods. Eventually it is bright green and a remains present as long as S+, the bright red key, as they are presented alternately.

As Terrace shows in a later paper, the same procedures can be used to transfer from an easy discrimination, such as the present one, to a more difficult discrimination such as between a key with a vertical line on it and an identical key with a horizontal line on it. The red-green control is first developed, then the vertical and horizontal lines are gradually faded onto the green and red keys respectively, then the colors are gradually faded off, leaving an errorless performance under the control of the more difficult stimuli.

When the performance of a bird that has developed good discriminative behavior by the errorless method is compared with good discriminative behavior developed in the traditional manner, (with numerous errors and considerable extinction responding) an important difference is noted. When S- is presented, the birds receiving ordinary training "...would usually flap their wings, stamp on the floor of the chamber, and orient themselves away from the key." Those trained with the errorless procedure simply "...lowered themselves away from the key and stood quietly facing it until the next S+ appeared." (Terrace, 1963a, p. 13) It would appear that as a result of unreinforced errors in the presence of S-, this stimulus acquires aversive properties. This interpretation is further strengthened in an experiment using tranquilizer drugs. It had been previously noted that chlorpromazine and imipramine disrupted visual discriminative performances of pigeons. This disruption could not be attributed to the sedative effects of these drugs since it occurred at considerably lower dosage levels than is required to produce noticeable sedative effects.

Terrace was able to show that when the discriminative control was developed by the errorless method no disruption occurred. The obvious interpretation is that in ordinary discrimination learning it is partly the aversive aspects of S- which determines the performance; and when the control of aversive stimuli is reduced by drugs, and we can presume by other means as well, the discrimination is not maintained.

These experiments have several implications for language learning, but the most important concerns the use of irrelevant stimuli and the prevention of errors. Extensive use can be made of irrelevant stimuli to make discrimination as easy as possible, but the irrelevant stimuli should be the kind that can be gradually removed. For example, in learning color names the critical stimuli could differ with respect to brightness, location in the room, size and shape. All of these can be faded away gradually. Order of presentation, however, should not be used, since it cannot be gradually eliminated.

Every effort should be made to avoid error responding. The development of erroneous behavior is an indication that the stimulus change has been too rapid.

It would be well, in this connection, to point out a similar possibility with respect to motor skill acquisition. In the teaching of complex motor skills, it is possible to design an environment which accommodates the learner's initial undeveloped repertory and which can be gradually faded into the final environment. The learner would not need to make any errors and could be reinforced throughout the entire learning procedure. For example, it would certainly not tax the ingenuity of our mechanical engineers and designers, to develop a sequence of shoe string tying apparatus that started with gross positioning movements and progressed in very gradual steps to the final task. Likewise, a series of apparatus which starts with a slightly raised portion of the floor and progresses into a set of steps and finally a tall ladder could be easily designed.

The successful exploitation of these techniques is primarily a matter of designing an effective learning environment and making use of standard electrical and mechanical engineering methods.

Discussion following Michael's paper

The immediate discussion turned to the general advisability of applying a token system of reinforcement to programs for the retarded. The eventual effect of such remunerative systems was questioned by some participants. Michael elaborated further upon the application of his point of view. It was explained that parents often use token systems to get their children to do things that are intrinsically unrewarding, yet these children themselves will later renounce pay for a task that has become too easy or else just socially expected. Dr. Michael contrasted his proposed system with more subtle reinforcers such as social approval. Here the group raised the issue - if the child is not reinforced, will he learn anything? Michael contended that while there will be behavior occurring where he could not identify the reinforcer, that most behavior in lower animals, as well as humans, will have identifiable reinforcers and can be altered by altering the reinforcer. Further discussion concerned definitions of reinforcement and the subtle and complicated events that reinforce humans.

At this point the relative potency of negative and positive reinforcers was explored. The distinct advantages of positive reinforcement for the educational setting, apart from potency, were explained. It was stated that negative reinforcement techniques often involve extremely repressive measures and ultimately produce revolt which would not be consistent with the educational atmosphere one would hope to create.

The next phase of this discussion turned to the relationship of chronological age to "good" token behavior. The intensity of the training necessary to produce such behavior in a 2 1/2 year old was contrasted with the relative ease with which such programs are adapted for ten year olds. Michael explained that most children by five have already learned token behavior from the culture; however the retarded child from a restricted environment or institutionalized setting may not have acquired the requisite antecedents. The importance of language development to the token behavior process was emphasized.

Further hypothetical situations were explored in order to visualize more clearly the application of such a system to school programs particularly in the area of developmental reading. The concern was voiced that reading skills developed in this manner will not be maintained after the program is discontinued or after the child leaves the school setting. Here, it was explained, the culture must be altered so that the behavior that is deemed desirable is actually maintained in some way.

The Development of Communication Skills

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In studying language development, we usually find it necessary to indicate successive stages of early functioning. However, since children differ in their patterns of growth, these stages or levels can be traced only in broad outline. If the child passes from stage to stage in a manner similar to the hypothetically normal schedule, he is regarded as a normal child. The normal child, however, should not be expected to maintain a predictable schedule in all phases of his speech development. He may be ahead at some stages and show a lag at others.

Even with the allowances for broad variations among children, however, there are youngsters who show such marked deviations from the anticipated stages that they are regarded as speech retarded. Sometimes we refer to these children as having delayed speech or delayed speech and language. Usually the child's deficient behaviors are not perceived as defective until he is three or four years of age. This does not mean, of course, that the deficient functioning really had its incipient phase at this time. In all likelihood certain aspects of the speech deviation are derived from experiences which date from infancy. This means that children who are eventually to be diagnosed as defective in speech may have failed to acquire some of the antecedent skills for normal speech during the early months of life. The reasons for this distortion or delay are often obscure. Among

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the reasons usually advanced are: 1) low intelligence, 2) brain injury, 3) bilingualism, 4) twin association, 5) physical disorder, 6) sensory disorders, 7) ill health, and 8) emotional disturbance. Any of these or any combination of them apparently can affect the child's development during the early learning phases.

Unfortunately, these listings do not indicate much about the process of language acquisition nor about the environmental factors which may influence language development. Likewise they do not indicate how a child develops communication behaviors which enable him to relate effectively to other people. It is the intention in this paper to focus upon the functional processes of language and communication, especially during four critical developmental stages, in order to suggest ways in which the process of acquisition may break down and ways in which it may be stimulated. In order to facilitate this discussion, I would like to re-label the phases of language development. In place of the conventional listings of reflexive crying, babbling, echolalia, and true speech, I would like to list the following four stages: 1) sensory stimulation and smiling, 2) attachment, 3) word acquisition and social exploration, and 4) language acquisition and experience.

Sensory Stimulation and Smiling

In the early days of life the newborn makes seemingly random movements to which adults react with little expectation of a returned response. Recent evidence, however, suggests that the newborn infant has a variety of adaptive functions. He can discriminate forms in the early days of life and prefers to look at increasingly complex and interesting stimuli (Fantz, 1963). The very young infant spends much of his waking moments regarding people and things. The newborn also demonstrates ability to learn to turn in the appropriate direction to be fed when held by its mother, but it is not until the appearance of the smile that adults become acutely aware that the child is responding directly to them. Studies of the development of smiling generally agree that smiling does not usually occur much before the age of one month (Ambrose, 1961). Thereafter developmental trends are notable both in the increase of the smiling response and in the nature of the stimuli which are required to elicit smiling. Smiling increases in frequency up to about the age of six months (Spitz, 1946, Ambrose, 1961).

Rheingold (1961) in her studies of three-month-old infants, has become impressed with their "alert, attentive, active, and responsive behavior". She says that already at three months, there has developed a responsiveness to stimuli in the environment and a searching of the environment for stimulation.

Rheingold, Gewirtz, and Ross (1959) have successfully demonstrated the conditioning of vocalizations in three months old infants by using the adult social response as a reinforcer. Noting that infants characteristically vocalize as part of the total response they give an adult, these workers counted vocalizations for nine three-minute periods distributed through the day for 12 infants. The experiments went on for six consecutive days. Four infants were used in each of three experimental conditions. During the first two days the experimenter leaned over the baby's crib with an expressionless face. In the second two days the experimenter reinforced vocalizations by simultaneously smiling, clucking, and lighly squeezing the infant's abdomen. During the last two days he maintained an expressionless face as he had during the baseline period. The results indicated significantly greater mean vocalization rate for the conditioning days than for the baseline days, and lower vocalization rate for the extinction days. This study shows that the conditioning of the infant vocalizations to social responses of an adult is possible as early as three months, and that the social response of an adult can serve as a reinforcing stimulus.

In another study with three months old institutionalized infants, Weisberg (1963) manipulated the social environment through eight consecutive days. When an unresponding adult was introduced and made a part of the environment, the infants did not increase their responses. However, when the adult briefly touched the subjects chin and simultaneously smiled at and "talked" to him, the infants vocal behavior increased.

Most prominent among the infant's waking activities is looking. His eyes move freely and often as he fixates on one object after another. Hearing a sound, he moves his head until his eyes locate the source. When his hands close on an object, he looks to the object. When he is placed in a prone position, he moves his head freely and looks. When picked up, his first activity is to look around him. At this age before he can reach out and grasp an object, he is already picking up the physical environment, but, as Gesell has said, "with eyes alone". Some objects obviously excite the visual regard of the infant more than others; these might be considered as arousers of attention. For instance, he looks at bright and shiny objects and at the lines of demarcation between brightness and darkness.

Above all, apparently, changes in movement in the stimulus object arouses the infant's visual regard. He seems to be attracted to the novel and the complex. More than to any other single object, he seems to be attracted to the human face. On occasion, of course, the infant will give evidences of delight to such nonhuman social stimuli as sunbeams, configurations on the wall paper, a rattle or some other bright object in his crib, or to the presence of other objects which may momentarily draw his attention. However it is the adult face which apparently attracts his attention most and which provides the bases for social interaction.

It is as he views the human face, usually his mother's, that the child provides the most obvious display of social responsiveness. It is socially significant perhaps that the face moves in response to the infant's own movements. If he smiles, she smiles; if he vocalizes, she vocalizes in turn. Rheingold (1961) feels that the human being is but another complex of stimuli; but because she is living she is more interesting, and because she is human she is more responsive.

In summary, Rheingold feels that during the primary activities of the infant's visual exploration of his environment, certain objects attract and hold his attention. To the most interesting of these, he gives facial, vocal, and bodily responses of delight. It is apparent, then, that long before the infant begins to use speech or to respond actively to the speech material of adults around him, he is engaging in a kind of visual, social responsiveness which is stimulating to the child and which involves reciprocal exchanges with adults in his environment. Ultimately these exchanges may be an important feature of his speech and language development.

The effects of these visual, social experiences are differentially apparent in the patterns of development of institutionalized and home-reared infants. For instance at about three months of age, the institutionalized and the home-reared infants, as shown in the studies of Rheingold, 1961, are apparently on about the same level of development. They respond with approximately the same kind of alacrity and with the same smiling modes and other socially responsive traits.

However, studies by Province and Lipton (1962) indicate that the institutionalized infant thereafter quickly becomes relatively less active and less responsive than does the home-reared infant who has probably, to a marked extent, attached himself to a "mother" figure.

It seems apparent that this more rapid learning on the part of the home infant is at least partially due to the fact that he relates more intensively and more frequently to a single adult and thus comes to be perceptually more attentive to the behaviors of this single person. The intensity of this communicative relationship provides perhaps a richer kind of social exchange at an earlier age than is possible for the institutionalized child. This richness of social exchange can be seen in the frequency of smiling and other social responses and also in the earlier and more precocious attention to the vocal and auditory components of the behaviors of the selected adults. Thus vocalizing becomes part of an active response system between the adult and the child. It is possible that this earlier development of an "interpersonal system" is one of the stimulants to rapid development of language.

In the early pre-linguistic periods of development, then, it seems important for the infant first to get a rich experience in social interaction with adults. The social experience may also be described as sensory stimulation through the mediation of adult "caretakers". This stimulation may be predominantly visual for the very young infant; but it includes also tactual, auditory, and kinesthetic modes. Casler (1961) has suggested that children "maternally deprived" before the age of six months probably are "perceptually deprived." Perceptual deprivation is defined as "the absolute or relative absence of tactile, vestibular, and other forms of stimulation." He states also that "recent neuroanatomical findings, especially those concerning the reticular formation, help to explain why perceptual stimulation is so important for normal development." (p. 49)

At sometime between three and five months of age usually, the infant becomes selectively aware of the identity of a person, usually the mother, who is able to mediate the world to him through visual, auditory and tactual impressions. Thus he becomes gradually more aware of the world outside the range of his own reach and beyond the limits of his crib. He becomes more communicative and is able to explore alertly and with increasing accuracy.

Attachment

During the period which we usually call babbling and echolalia, it is apparent that the response system between the child and the adult becomes even more active. It thus becomes evident that there is an attachment formed between the infant and the mother (or caretaker) in home environments. Schaefer (1963) has advanced an hypothesis in three parts to explain the child's development of attachment behavior. He indicates that attachment behavior is simply a child's social attachment to a person, usually the mother, which seems to influence his responses to social stimuli which are provided by this person. The concept of attachment seems applicable especially during the period from approximately six to approximately fourteen months. Schaefer's three stage hypothesis includes an early phase in which the infant seeks optimal arousal from all parts of the environment. During a second phase the infant, having learned that social objects provide the best source of stimulation, shows indiscriminate attachment behavior to all human beings. This second phase then finally gives way to a still later phase during which the child forms a special attachment or attachments to those in his immediate environment.

The three stage hypothesis of Schaefer may be analyzed then as follows. First, the infant finds objects in his environment to be intriguing and interesting. He visually attends these objects and learns to smile in relation to them, his smile being something more than just a visual regard for the object. He comes then to learn that social objects, particularly faces of people, are the most interesting and the most responsive of all; and so he becomes attentive to these objects and smiles in greater frequency and duration in direct relation to them. Fortunately, these social stimuli also respond to him, and so there is an intensification of the exchange that takes place. The third stage, of course, is the one in which the child develops a preference for some adult or adults and forms an attachment. To these people he responds with greater intensity and takes on a wider range of social behaviors interactively.

During the period of attachment, Schaefer (1963), feels that children differ markedly in the amount of stimulation they seek. Whereas some babies will lie in the crib or participate in a social experience with an air of contentment and relaxation making few demands upon the parent, other babies will insist upon viewing everything and will not want to miss anything during an experience such as a walk or a play activity. They may, for instance, show a tendency to cry the moment that they miss out on anything.

Schaefer (1963) feels, then, that there is a need for the parent to provide a condition of mutual adaptation so that the parent's responses are cued somewhat by the needs and demands of the infant and again the infant can learn through experience to respond to the tendencies of the parent. Consequently, there is a mutual exchange so that there are appropriate amounts of stimulation provided the infant during this critical (attachment) phase. If infants are left to cry excessively either through boredom or "separation," they become upset. The child shows special concern when he is separated from the person with whom he has formed the attachment. The infant's reactions to separation seem to reach an optimum at about seven months of age. As early as five months the infant may show concern for separation, but he is more likely to be concerned about separation from any caretaker figure whether or not it may be the parent. The more personalized and focused concerns expressed by the seven month old, in contrast, are indications that the child has come to view people more selectively and that he has formed an attachment for the selected one(s). For this reason Yarrow (1964) suggests that this may be an unfortunate time for changes in the child's home placement. Stability in the maintained mother-child relationship may be more important than is popularly believed.

Yarrow (1961) has reviewed a number of studies of the effects of early deprivation on infant and child development. During the early months corresponding to the usual babbling (attachment) period, he describes the mother as a mediator providing sensory stimulation to the infant through tactual, visual, and auditory media--for instance, through handling, cuddling, talking, and playing with the child, as well as by simply being visually present. The mother also acts as a mediator of the environment, sometimes buffering and sometimes heightening the intensity of the stimuli. The meaning of these mothering activities to the child and the impact of the mother's absence varies with the child's perceptual, cognitive, and motor capabilities at different developmental levels. On the simplest level, if the mother is not present, the infant may be deprived of social and environmental stimuli which a mother ordinarily makes available to him. At this point, the mother's absence represents a deprivation of distinctive stimuli offered by a social being. The impact on the infant may be even more severe since the mother's frequent or prolonged absence is often accompanied by deviations in patterns of care, such as failures to respond to the child's physical needs and wants or long delays in providing gratification. The significance of these kinds of frustrating experiences will be modified by the length of time during which they operate, by the developmental level of the child, and by the degree of autonomy which he has achieved.

Yarrow (1961) devised a concept of deprivation in three distinguishable areas: sensory deprivation, social deprivation, and emotional deprivation. In many settings during this period of attachment, all three types of deprivation occur and may be complexly related; but they do not necessarily vary concomitantly. The author assumes that they can be independently manipulated in research. The studies on sensory deprivation in animals indicate that complete restriction of perceptual experience in early life results in serious impairment of the function. The degree of sensory deprivation is less severe in institutional environments than in the described animal studies; nevertheless, developmental retardation is found in institutions with the degree of deprivation correlating generally with the extent of retardation.

Social deprivation probably leads to disturbances in social functioning, such as social apathy and social hyper-responsiveness. The simplest hypothesis related social apathy to inadequate social stimulation during a developmental period which is critical for the acquisition of social responsiveness. If social deprivation occurs after appropriate social responses have been learned, intensified seeking of social response may occur. Yarrow (1961) presents a refined hypothesis regarding the significance of the timing of experiences in the critical phases. The hypothesis holds that there are points in the developmental cycle during which the organism may be particularly sensitive to certain kinds of events or most vulnerable to specific types of deprivation or stress. "On the basis of our knowledge of the developmental characteristics of children, one might postulate differing vulnerabilities at different periods of development...With regard to separation, the period during which the child is in the process of consolidating a relationship with his mother may be an especially vulnerable one." (p. 484)

In the period following the six or seven months stage of attachment, it becomes apparent that there is an active imitation or response pattern on the part of the child of the mediating adult. It is also apparent that the adult can imitate the child during this time and elicit further responses from him. The child also is able to alter his behavior in response to the stimuli models provided by the adult. Here again we see that there is an active kind of learning experience which may ultimately lead to more evolved communication behaviors.

Word Acquisition and Social Exploration

The third critical stage, namely word acquisition and social exploration may be assumed to begin roughly at 12-14 months. This corresponds generally to Scott's

(1963) transition period II, which he assumes to extend up to approximately 24 to 27 months. He describes this as a period of increasing independence in the locomotor functioning and verbal utilization. The child understands human speech to an increasing degree and begins to use his own verbal efforts to control his environment. The child's verbal experiences, of course, did not actually begin at this time; probably as early as eight to ten months he had a degree of understanding of the symbolic behaviors of the adults around him. He was able to recognize certain words, phrase structures, intonations, symbolic gestures, etc. as having meaning. The starting point of his own meaningful voluntary use of vocal language is difficult to distinguish. "The first word" as reviewed by Darley and Winitz (1961) suggests a wide range of different criteria. However, in any event an adult auditor usually determines that a word has been used appropriately in a context before we can meaningfully attribute the word usage to the child. Words are likely to be rather slow in emerging for approximately six months after he uses the first one. During this time the child's vocabulary may not extend beyond a handful of appropriately used symbols.

The utterances learned in the period from 12-18 months are likely to be learned as whole units and may actually be a composite of several words used by the child as one response. However, they have one-word type characteristics in that they imply a specific action or a specific object. This is the period of the one-word sentence where a single word or word-like utterances can stand for a multiplicity of meanings and can be used in many different situations.

Piaget* describes six stages within his larger period of sensory motor development. The fifth of these stages is especially relevant to the study of word acquisition. Two of the principle functions the child engages in during this time are imitation and what Piaget calls elaboration of the object. During this period, too, the child reaches a level of physical independence. The new objects become coherent and ordered. Spatial, temporal and causal relationships are perceived; and verbal communication becomes important as a means of closing the spatial gap between himself and others. It is significant, perhaps, that at this time the child has mastered the ability to imitate speech responses of adult models. He also has some words or word approximations to use as a handy means for attracting attention of these adult figures. During the word acquisition phase then the child is likely to use word responses which eventually come to resemble closely the verbal units used by the parent. The responses are also soon used purposefully in communication contexts; however, since the meanings which the word has for the adult may differ radically from the connotative and referent meanings it has for the child, there may be some bases for critical misunderstanding.

This possibility is highlighted in Piaget's description of symbols as more or less private, non-codified signifiers which usually do bear some objective similarity to their referents, but which nevertheless are considerably private and personal to the infant. He further describes the first signifiers as private non-verbal symbols which emerge toward the end of the period of sensory motor development and which may not initially be linguistic signs but which can best be called symbolic functions. He feels that this function gives rise to the acquisition of words rather than the acquisition of words giving rise to the symbolic function. In essence he feels that what happens is that language first acquired through the auspices of a symbolic function lends tremendous assistance to the subsequent development of the latter. Piaget assumes then that the first signifiers of the child are private symbols rather than social signs. Perhaps the first words a child acquires functions as semi-signs or signs which are thoroughly impregnated with private symbol characteristics. These semisigns refer much more to idiosyncratic and ever changing schema of action than to fixed and stable classes of objective realities. The child may for a long time find verbal signs to be both difficult to grasp and generally unsuitable for the representational expression of the entities with which he is preoccupied. He responds to this state of affairs "both by continuing to rely heavily on non-verbal symbols and by simulating words to his symbolic orientation..." (Flavell, 1963, p. 155).

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*In Flavell, J. H. The Developmental Psychology of Jean Piaget. Van Nostrand, 1963.

Piaget further states that the egocentrism of the small child makes him unaware of the differences between his own private orientations to words and the orientations of adults. He may, in fact, use a word which has only idiosyncratic meaning for him and encounters considerable reaction from adults who may assume that he is using the word in its more standard sense.

Luria (1961), talking about the acquisition of words, gives a substantially different picture than the one generated by the system of Piaget. Luria emphasizes the importance of the infant's continuous interaction with the adult world. In referring to the child's dependence on the mother during infancy he describes the emerging speech in terms of the mother's naming of various surrounding objects and then giving the child orders and instructions. In this way the mother shapes his behavior. Having carefully observed the objects named by his mother after he acquires the faculty of speech, the child begins to name them actively enough to organize his acts of perception and his deliberate attention. "When he does as his mother tells him he retains the traces of verbal instructions in his memory for a long time. Thus he learns how to formulate his own wishes and intentions independently, first in externalized and then in inner speech. He thus creates the highest forms of purposive memory and deliberate activity. What he could previously do only with adult help, he is now able to do unassisted. This fact becomes a basic law in a child's development." (p. 17)

Luria feels that many psychologists overlook the social origins of these mental processes. Instead they interpret active attention and deliberate action as being the inherent properties of mental life, which they believe to be rooted in the depths of the mind and not in the real external forms of the child's relationships. He feels that these complex processes can be studied step by step beginning with early infancy. "When a mother shows a child something and says "cup", first her pointing and then the name of the object cause an essential modification in the child's perception. By the laws of temporary links, the mother's gesture and the word designating the object become secondary signals causing marked changes in the range of stimuli acting on the child. In isolating the object from its environment, the action of pointing reinforces the stimulus, making it a figure set in a ground. The word designating the object delineates its essential functional properties and sets it within the category of other objects with similar properties; it serves a complex task of analysis and synthesis for the child, and later settles into a complex system of links acting on him and conditioning his behavior." Luria (1961, p. 19). Thus, he becomes capable of actively modifying the environment that influences him. By using speech for himself he alters the relative strength of the stimuli acting upon him, and adapts his behavior to the influences thus modified.

Luria thus speaks of speech as being an added dimension in the child's experiences with the surrounding world. By giving names to objects, he actually changes the perceptual functions these objects play in his life. He is able, therefore, to relate symbolically, starting with the primary function of naming and moving on to a relationship to the surrounding world which is basically symbolic in nature.

Whether one orients to the primary stages of intellectual development as described by Piaget or to the socialization processes as described by Luria, it is apparent that the period of word acquisition constitutes a transition on the part of the infant from the more dependent state of infant life to a more exploratory and active relation with the world. It is also apparent that the interaction between the infant and adults in his environment play an important part in the nature of the child's language learning. It might be meaningful to examine this interaction in the framework of reinforcement theory which holds that the child tends to learn whatever responses are reinforced either by some immediate drive reducing reward or by some indirect secondary cue of an eventual reward. "Responses which are not so reinforced tend to drop out of the child's repertoire. The responses which are involved in these events may be direct responses to external stimuli or they may be operant responses which like babbling, are somehow internally initiated."* The most ambitious effort to work out details of such a theory as applied to language learning is Skinner's Verbal Behavior, (1957).

"This and other positions are summarized by Miller (1951) and by Osgood and Sebeok (1954). Miller and Dollard (1941) hold that the child has no native instinct to imitate or copy behavior, but can learn to do so even in rather early stages of language development, when imitative behavior is rewarded."**

How do words first acquire word meaning? That is, how does the child learn to associate a word (sign) with an object or event (significate). Osgood, (1953, 1957, 1961) and Mowrer, (1960), have discussed this intriguing problem area at length. They have suggested a classical conditioning mediational model to explain the acquisition of word meanings. Jenkins and Palermo, (1964, p. 162-163), discuss mediation as a principle feature in the acquisition of syntax. Their description is quoted in substance in order to preserve the accuracy of their statements. They ask, "How does language get under way? We think the children imitate the speech around them. They imitate because it is a functional property of the nervous system because they are reinforced for imitating by other humans, because imitation is secondarily reinforcing, and because very soon the behaviors involved have functional properties for them as instrumental acts. We believe that associative correlates between verbal behaviors and events in the world around a beginning speaker rapidly appear through simple s-r laws and that the labeling or naming in its broadest sense ought to be one of the earliest forms to appear. It is clear that many general classes of behavior are present before the speaker learns labels for the salient objects and events involved and we assume that the labels are readily used as instrumental acts within already developed behavior repertoires. It seems reasonable to suppose that these early labels are attached to the functional properties of the situation which are of importance to the child as the result of his experience with the world or to properties which are salient in his stimulus field..."

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*Carroll, John B., Language Acquisition, Bilingualism, and Language Change. Chapter 6, in Psycholinguistics, Sol Soporta, Ed., Holt, Rhinehart, and Winston, 1961, p. 33.

**Carroll (1961, p. 333).

Studies of infants during the word acquisition stage are difficult to conduct primarily because of the private world within which children are reared. Consequently there are only a few studies of children during the 12-18 month period relative to the interactive effect of reinforcement upon the acquisition of behavior. There is, however, considerable general support, such as McCarthy's prediction that the quality of the child's early linguistic environment is the most important external factor affecting the rate of language development. Bossard (1954) has documented the very wide variations which exist in the role of language in family life. There are numerous studies linking the rate of language acquisition with socioeconomic factors and with factors such as institutional living as compared to home living. Generally it is assumed that there is some correlation between the rate of the child's acquisition and the amount of experience that he has had with adults and with a variety of material and stimuli in his environment. Experimentation generally suggests that there is a tentativeness about the child's exploration of his environment during the early months of the second year. He is therefore open to experience, but perhaps easily disuaded from the acquisition of verbal symbol behavior.

Language Acquisition and Social Experience

Beyond the word acquisition stages, small children begin to use combinations of words which can be analyzed in more complete form by means of linguistic assessments in such areas as phonology, morphology, syntax, and semantics. Even though the first words of a more complex nature may still seem similar to the one word acquisition phase, it is likely that a meaning has been expanded so that the symbols are actually more like complete thoughts. For example, "Teddy", for "Teddy Bear", may mean "give me my Teddy Bear" or "I want my Teddy Bear" or "where is my Teddy Bear" or any one of many other possible such meanings. Miller and Ervin (1963) suggest that the child begins forming primitive sentences of two or more words before his second birthday. They find, however, that the grammar of these sentences is not identical with the adult model, but that it is possible to translate their utterances into the adult model by the acquisition of certain function words and inflectional affixes. It appears that the children select the stressed utterance segments which usually carry the most information. Brown and Fraser (1963) have called this a telegraphic version of English. They suggest, too, that children's language undergoes a constant process of change through imitation of adult models.

If we wish to break language down into some linguistic segments, we might best begin with a discussion of phonology and include then, in order, discussions of morphology, syntax, and semantics.

Phonology*

Studies of the phonological development of children have in most instances used the techniques of the descriptive linguist and have described the phoneme system of a number of infants (Leopold, 1947, 1961; Velten, 1943; Albright and Albright, 1956, 1958; and Applegate, 1961). From this point of view, phoneme system learning is described as the progressive differentiation by the child of the phonemes of the community language (Jakobson, 1941; Jakobson and Halle, 1956;

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*See definition of phonology, morphology, syntax and semantics given in Carroll's paper.

and Berko and Brown, 1960). At each stage of the development, the phonemes of the child show increasingly the characteristics of the phonemes of the adult. An orderly sequence of this development has been tentatively put forth by Jakobson and Halle (1956).

It is recommended that the Jakobson rules of substitution be used in studying the phoneme development of a small number of children. Research to date suggests that the child's phonological system closely approximates the model of the adult by the fourth year. Longitudinal studies of the phonological systems of children should reveal their comparative rates of development and the degree to which substitutions are retained at different age levels.

Careful assessments of the phonological development of children, then, would provide a prediction as to points of comprehensibility for given words or possibly for phrases which can be analyzed for accuracy and for possible comprehension by adult listeners. In this way the functional articulation of children can be analyzed in relation to the demands of the communication situation.

Morphology

It is likely that morphological data will show considerable influence of subcultures upon the speech development of children. The preschool child's knowledge of morphological rules as tested by Berko (1958), Berko and Brown (1960) could be determined. At what point does the child start to form plurals of nouns, past tenses of verbs, or add the _s_ morpheme to indicate third person singular of verbs in the present tense? At what age and how closely does the child acquire conformity to the morphological patterns of the home and/or community? Are such patterns easily modified by a nursery school setting?

Syntax

The syntax of children can be studied in reference to variations in the normal acquisition of a grammatical structure. Data can be derived by evaluations of generative grammar (Harris, 1957; Chomsky, 1957; and Lees, 1960) which can be designated to show the nature of the child's grammatical system. Generative grammar presumes speech behavior to be guided by a series of implicit behavioral decisions. These decisions are selections of linguistic elements--words, grammatical elements, and syntax. These decisions presumably generate speech.

The work on evaluation of syntax by Brown and Fraser (1963), Brown, Fraser, and Bellugi (1963), Lenneberg, Nichols, and Rosenberger (1962), and Miller and Ervin (1963), should be carefully studied in developing a method for evaluating the development of syntax. The general hypotheses put forward by Jenkins and Palermo (1964) might be carefully studied as evaluations of syntax are made available. They suggest that reinforcement and primary stimulus generalization play a part in the emerging development of syntax. If the child makes a construction which is like the adult construction, they assume that this

(a) has a greater likelihood of being praised by others;

(b) has a greater likelihood of inducing others to respond linguistically which we presume is reinforcing;

(c) has a greater likelihood of eliciting nonverbal behavior from the audience, if any; and

(d) is secondarily reinforcing. All of this (they feel) should lead to the greater selection of some sequences over others with this particular operator and because of the semantic correlates probable in the successful utterances, to a semantic correlate of the class." (p. 163).

In support of their hypotheses, Jenkins and Palermo, (p. 166-167), point the findings of Werner and Kaplan, (1950), Brown (1957), Berko, (1958), Brown and Berko, (1960). In particular they feel the findings support the view that children shift from sequences to classes and thus develop their own semantic systems, which are then employed in their own selective utterances. Again, the development of similarities between the child's syntactical development and the syntax of the parent can be used as a basis for comparative study.

Semantics

The semantic evolvement of a child's language may be considered in relation to his development of concepts. Conceptual development seems to be closely correlated with measures of intelligence, and both may be influenced by conditions of reward in the child's environment. Considerable work has been done by Luria (1961) and others in studying environmental influence on concept development. Perhaps their work can best be understood within the framework of what they call the second signal system, which is a term often used in contemporary Russian psychological and physiological literature. Briefly, the second signal system is the portion of the nervous system that is concerned with verbal behavior. The second signal system enables us to respond to words as "signals of signals". Just as a light may act as a signal for the impending appearance of food, the word light becomes a signal for the light. Of course, a verbal stimulus affecting the second signal system does not, in general, stand for one particular stimulus of the first signal system. It stands for a whole class of nonverbal stimuli with a certain property or set of properties in common. The second signal system thus makes possible high levels of abstraction.

There are several differences between the first and second signal systems. For one thing, the second signal system seems to work according to something like the old principle of association by contiguity. If a word is frequently encountered together with an object that the word represents, the object will acquire an association with the word and the word will evoke responses appropriate to the object. The associations on which the second signal system depends can be formed rapidly. It is possible that the associations can be formed as one-trial learning and be retained over a long period of time. The learning available through the second signal system can also be amazingly flexible. The concepts inherent in the second signal system can be used profitably to study young children, and it is this work which is of particular significance in the Russian literature.

Very early the work of Ivanov-Smolensky pertained to the study of generalization involving verbal stimuli. He found repeatedly from the start that there would be considerable generalization between a verbal stimulus and its corresponding nonverbal stimulus. For example, if a child were taught to perform certain responses upon perceiving a bell, the word bell would be found without further training to evoke the same response. Similarly a response that had been established to the word would generalize to the corresponding nonverbal stimulus. There were also studies of generalization between words as to be expected. A response will generalize from written to spoken versions of the same word.

Particularly interesting are cases of semantic generalizations. Carroll (1963), suggests that the semantics of grammatical transformations would be especially interesting to study. He suggests an approach which might provide valuable information on the psychological antecedents or stimulus conditions that evoke characteristic responses in children. He suggests that deficient communication responses of some children may indicate inadequate experiences in choosing an appropriate sentence type for a given situation.

Applications of Developmental Information to the Study of Mental Retardation

Mental retardates are often not diagnosed until the second or third year in school. For this reason subject populations in M/R studies often are made up of older children simply because they are accessible. Unfortunately children in special classes cannot be used to provide data regarding language development. Children with delayed language brought to child guidance or diagnostic clinics where small children are routinely studied are perhaps more appropriate subjects for such research. In such instances it might be expected that the linguistic dimensions just described could be utilized in studying small children and their parents. Other and perhaps more fruitful approaches to the study of language development and its possible relations to the understanding of mental retardation could be undertaken in communities where predictably high incidences of retarded functioning are to be found. Such settings might provide the best opportunity for studying the "delayed" language of infants and toddlers. Studies of selected groups of small children might, in such settings, be carefully developed; and data might subsequently be used as a means for analyzing the development of the child in retrospect. Children who subsequently experience difficulties in school and present problems of poor achievement and poor social behavior with accompanying language deficits and who fall below "normal" levels on an intelligence test might therefore be studied in light of language data which had been carefully recorded over time. In this way we might be able to describe the language development of the child in relation to carefully developed information regarding the types of family influence, language models of the parents, and perhaps the type of reinforcement which was characteristically made available to the child during the months and years antecedent to the educational diagnosis.

Perhaps in this way we can more fully understand the impact of the environment upon the child's language acquisition, and the relation of language to academic and social performance. Also through selective treatment programs during the preschool years we can better understand the potential of treatment approaches for altering the patterns of language in accordance with more desirable forms.

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Discussion following Schiefelbusch's paper

As a result of Schiefelbusch's presentation, the discussion turned to the works of Vygotsky, Luria, and Zapozhets, which are also discussed in the later paper by Richardson. The infant and young child's response to varying visual and auditory stimuli and the development of language from a primitive level to a more complex behavioral level were discussed. Attention was called to Berlyne's (1963) review of Soviet research on intellectual processes in children.

The visual effect of the human face in eliciting infant smiling responses and the attention producing effect of the infant's smiling (for the adult) was assumed to constitute a communication experience.

The sequence of environmental stimuli from primarily visual to auditory-visual in the young child was mentioned. Age possibilities for initial responses to discriminative stimuli were considered. Whether researchers should consider only sensory stimulation for the very young child or seek to be more specific was proposed as an issue for further research.

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Language and Mental Retardation:
Empirical and Conceptual Considerations

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A fundamental question which is rarely given sufficient attention is the nature of the condition we call mental retardation. Too often the issue is pursued at the level of formal definitions and their adequacy. More fundamental is the attempt to delineate the areas of functioning which are involved in an ontological sense and to identify those which are affected in a functional sense. Language behavior in retarded persons is relevant for two reasons. First, language behavior and mental retardation have been intimately related since the time of Binet. It will be recalled that Binet and Simon defined idiocy and imbecility in terms of communication: verbal communication difficulties characterized idiots, as they termed one group, whereas written communication was the equivalent process in imbeciles (13). Second, language is relevant because it illustrates the pseudo-sophistication and partial accuracy of our thinking about retardation. This may be seen in the generalizations all too often used to summarize language development in general (124), and in the retarded particularly (77). Partial validity in our ideas about mental retardation is also illustrated by the relatively pessimistic views which have traditionally been expressed concerning the relevance of speech therapy for retarded children. This paper will attempt to examine the nature of our knowledge of language in the mentally retarded and perhaps, by that act, to reduce a little of the ambiguity concerning language and the behavioral complex we call mental retardation.

INCIDENCE

In general a great many studies have demonstrated that language deficiences in the form of speech defects occur in retarded children (4, 15, 25, 27, 32, 33, 34, 38, 39, 43, 45, 51, 52, 54, 57, 59, 65, 69, 71, 89, 92, 94, 95, 100, 103, 109, 119, 128). The frequency of this occurrence has been reported for various populations. Bibey estimated that incidence in the population of the Training School at Vineland at sixty-six percent (10) whereas Gens examined the segments of that population on two occasions and estimated the incidence at sixty and seventy-five percent (32, 34). An incidence of seventy-nine percent was given by Schlanger and Gottsleben in 1957 (100); this figure was given several years after the estimated previously cited and was based on the total enrollment of patients in the institution.

Estimates from other populations include seventy-nine percent incidence of children in special classes given by Mathews (69); a figure of sixty-six percent was advanced by Sirkin and Lyons (109), derived from the population of the Newark State School. Sachs found speech disorders in fifty-seven percent of two hundred and ten mentally retarded young persons (89), and Schlanger found an incidence of fifty-seven percent in a group of seventy-four children at St. Coletta's school (93).

The figures given all show a high incidence, and the differences between them reflect not so much inconsistencies as accurate representations of specific populations. Clearly not all retarded persons are alike; it follows that the consistency with which retardation is found will vary still more as populations studied reflect more than situational differences. For example, investigators have considered subgroups based on clinical syndromes and severity. Institutionalized retarded epileptics have been studied, and speech defects were found in seventy-six percent, according to Gens (33). Twelve of thirty-six mongoloids were stutterers, according to Gottsleben (39). Shover reported that fifty percent of the three-thousand cerebral palsied persons in Illinois were probably speech defective (105), and Wolfe found inadequate speech in seventy percent of fifty cases of cerebral palsy (126).

Severity constitutes a significant dimension of mental retardation. Schlanger analyzed a population between IQ 45 and IQ 70 and found an incidence of speech defects amounting to sixty percent (95). Using subjects below IQ 50, Lubman found eighty-five percent had speech defects (60). Among the more seriously retarded, Sirkin and Lyons found an incidence of seventy-four percent (101). The total absence of language is sometimes encountered in the severely retarded; Karlin and Kennedy found fifty-nine percent of thirty-two persons below IQ 20 were mute (51), and Lewald gave an incidence of fifty-seven percent in a similar population (59). Johnson, Capobianco and Miller substantiated these findings in their study of trainable children (46). They observed fewer articulation errors in their brighter subjects. All of these studies indicate that mental retardation and linguistic retardation are correlates. We may conclude that the relationship is documented as a phenomenon. What is not covered by such findings is the nature of the association between the two conditions.

MENTAL RETARDATION AND LANGUAGE DISORDERS

The connection which has been posited most consistently is that between retardation and language defects as independent entities which are connected by a causal relationship. The relationship has been substantiated by several lines of reasoning. Delay in development of speech in retarded children has been consistently reported (1, 24, 45, 57, 60, 71, 72, 78, 86, 102, 103, 117, 123, 128); and mental age, which is a developmental gauge in persons of all intellectual levels, has been found particularly influential in predicting articulatory proficiency in retarded persons by Bangs (4). Several investigators have related language disorders to developmental disorders of early origin. Beckey found delayed speech associated with gestation and pregnancy disorders in 1942 (7). That investigation touched on issues which Hess et al., (44) considered a decade earlier and which Jordan (49) has examined recently--namely, the extent to which various aspects of childrens' functioning, including language, may be understood in the stream of biological development. In general the evidence of these studies suggests that prematurity and other complications of the early developmental period have sequelae which include language problems.

Jordan's evidence did not find linguistic problems as serious or as widespread as academic and intellectual consequences of early adversity (49). A clinical observation by Schlanger (97) may be cited at this point: he reported a great deal of speech in a girl with an IQ of 38 and described her language as an "almost compulsive garrulousness." Undoubtedly the language was poor in content while profuse in output. Copeland has reported quantity of vocalization greater in low ability than in high ability retardates (19). These findings should serve to check the tendency to oversimplify the connection between language and retardation. Some types of linguistic disorder, e.g., dysarthria, are linked to mental immaturity fairly readily. However, language is other things. Language has a structure, and this aspect needs exploration. A number of studies have shown that the quality of language produced by the retarded is consistently inferior to that of the non-retarded. Abstraction is less common in the language of the retarded, as Badt (2) and as Feifel and Lorge (30), among others, have demonstrated (12, 41, 44, 76, 81). Sentences are often shorter, and the syntax is usually below age expectancies (17, 23, 35, 72, 76).

Language has a high mediating value in the cognitive and behavioral processes of the retarded (9, 22, 41, 61, 62, 63, 88, 120). Language viewed in this fashion becomes, not so much a correlate or a consequence of retardation, but a dimension of the nexus of behaviors to which the term "mental retardation" may be applied. Lyle has observed that language in moderately retarded children ("imbeciles") is characterized by failure to develop beyond stereotyped patterns of speech (64). The result is a failure to reach a conceptual level of language achievement. More analytically, the Soviet scientist Luria has considered the role language plays in regulating behavior in retarded children (62). Speech, he says "revives traces of past experience..." and leads to direction of behavior by means of this "signal system' which allows generalizations from past behavior. Retarded children, according to Luria, cannot use language efficiently to mediate learning experiences. He says retarded children cannot fixate the significance of experience as normals do, which is an expression of neurodynamic disturbance of "the second signalling system" (61). In the United States Berkson and Cantor have studied mediation in retarded children and confirmed its role in verbal learning (9); Griffith and Spitz have studied verbal mediation and its role in the formation of concepts by retarded children (41, 42). An investigation prior to the two just mentioned was conducted by Riess in 1946 (83). It is relevant here, not because it used retarded subjects, but because it self-consciously drew on the Russian tradition of studies on the topic. Recent surprise at Luria's approach to language studies is perhaps best formulated as a consequence of investigators' failure to continue the work begun domestically by Riess. Work in a third country in the style, if not the idiom, of Soviet research has been reported by O'Conner and Hermelin in Great Britain (80). The first of their studies suggested the possibility of building learning sets upon semantic lines; the second showed that free associations to previously learned words could also be understood in terms of semantic connections.

The studies just considered are different from the concept of language as words which are mispronounced or poorly articulated by retarded children. They suggest that language behavior is a part of the processes which are involved when we begin the study of children who fail to meet important educational and developmental norms. Viewed in this light language is one of the functional (as opposed to ontological) attributes of children which may fluctuate as a consequence of circumstance.

A variety of influences may shape language, apart from any putative mental retardation. De-emphasis of the normal processes of family stimulation, the "fun, food and friendly companionship" of which Mowrer spoke, is an important factor; and it is common in the rearing of retarded children (48). Disruption of mother-child relationships depresses speech development in retarded children, according to Lyle's work (64). Separation from the family in the form of institutional living shapes the language behavior of children (2). Schlanger has demonstrated how swift these effects can be. A mean period of residence at St. Coletta's of three years and seven months significantly reduced the length of sentences evoked under standardized conditions (96). Institutional living is itself a condition which has many forms. Wolfensberger, Mein, and O'Connor have studied the problem and believe that institutional living need not impoverish language behavior (127). Lyle's (64) program of linguistic studies has shown that the impact of institutional living on retarded children is partially determined by attributes of the children themselves. He has found that moderately retarded children who have not developed language prior to entry find institutional living more inhibiting than comparable children who have already developed language. The more favored of these two groups was, however, less well developed than comparable children matched by non-verbal MA who were not placed in institutions. This is of course a reflection of policies on the purposes of institutions and on the values which guide their programming. In a similar vein Jordan and deCharms found that stories given by retarded children in special classes were significantly longer than those given by matched children for whom no special classes had been available (50). The language in this last instance was elicited during the administration of projective measures of personality.

Language as a dimension of behavior may be used for an additional form of study, the type we call differential diagnosis. Two aspects of this matter may be studied. First, language gives us the basis for deciding if retardation or some other construct accounts for deviant behavior (10). Careful study of language may lead us to consider constructs such as autism (91), deafness (56, 67, 68), neurosis (90) or aphasia (122, 128) as more relevant than retardation, basically, or constituting what Wood referred to in her account of over one-thousand children as "the primary problem" (128).

Apart from considering language as an explorable dimension of functional behavior leading to better diagnosis, we may also examine it as a dimension with growth possibilities. These may take the primary form of improved language and are illustrated by the outcomes of speech therapy. Articulation can be improved, increasing the efficiency of communicative behavior. This has been demonstrated in such representative studies as those of Donovan (25), Lassers and Low (58), Schlanger (95), and Mecham (72). Improvement is possible in seriously retarded children, as Lubman (60) and Schlanger (95) have shown. In the case of the severely retarded, that is persons who may generally be mute, progress is also possible. The gain needs to be understood more in terms of growth from the initial linguistic status than in reference to some optimal state of language. Kolstoe has documented this (57), as have Schlanger (99), Spragge (115), and Wilkins (123). In such cases progress needs to be appreciated as raising the level of behavior in a human being. It should be viewed as making a change, although modest, in the status of the person. In this sense the all too common paradigm of retardation as a source of language status is quite reversed. Behavioral status is altered by language status; retardation as a pattern of behavior is modified by improvement in one component of the pattern. An atypical but not ineffective application of chemotherapy (Tolserol) has been reported by Mecham, Courtney and Soderberg (73).

A secondary form of change is the by product of attempts to improve speech; it is the commonly reported growth in adjustment and affability by retarded children who have received speech therapy (25). Rigrodsky and Steer observed that children who had received forty daily lessons were "more spontaneously verbal" (87), a finding complementary to Mecham's report of longer sentences produced by mentally retarded children after speech therapy (72).

Schneider and Vallon reported improved adjustment after speech therapy (102). An increment in personal independence has been measured by Lyle (64). Wilkins reported the results of speech development activities in a twenty-nine year old mongoloid who had only a handful of words at his command (123). His subsequent status was, "more alert, interested, cheerful and assured," apart from some modest linguistic gains.

A third form is exemplified by Smith's work (110, 111, 112). He identified and matched two groups, each containing sixteen retarded children. Instruction was given to one group using lessons whose content was structured by Osgood's ideas on psycholinguistic processes. After eleven weeks growth was measured, and the psycholinguistic attainment of the experimental subjects was found to be significantly greater than that of the control group. The gains were not stable when measured about a year later (112). Since the initial period of instruction was thirty-three sessions of forty-five minutes, there is reason for optimism concerning more extensive periods of instruction. Precisely what cognitive change is measured when linguistic attainment is tested remains a provocative question (55).

It is appropriate to point out that linguistic growth is a process we have yet to understand, even in non-retarded children. Categorization of consecutive stages of attainment has been helpful, but the processes of change which underlie the stages are not well understood. Retarded children impinge on this inquiry in two ways. One point of view is that retardation of intellectual growth rate provides a paradigm for conducting investigations. The opposite point of view suggests that the study of language growth in the retarded depends on more than intellect. Siegel (106) and Siegel and Harkins (107) have shown that adult expectations affect and are affected by the language behavior of retarded children. Concomitant factors must always be considered, elements which are usually disturbed in the life-space of retarded children.

In general, linguistic behavior constitutes one of the more dynamic aspects of behavior in persons who are considered mentally retarded. Language is a process which shapes and is shaped by other traits. Rather than considering it a thing apart from retardation we should consider language one of the primary dimensions of behavior (80). Language is a significant element in the nexus of behaviors to which the term "mental retardation" may be attached with accuracy.

EMPIRICAL CONSIDERATIONS

So far the discussion has considered conclusions about language in the retarded which are supported by evidence. The evidence itself is a legitimate object of inquiry since its adequacy is basic to any conclusions we may wish to draw.

Measures. The evidence gathered in studies of language in the retarded tends to be rather consistent in its form. Age at acquiring speech and its correlates in the form of surveys of incidence have been conducted frequently (1, 16, 23, 49, 69, 71, 78, 103, 94, 99, 117, 126). These studies have generally reflected variation in criteria and in the sub-populations from which they have been drawn. In no instance have incidence figures been modified by converting language disability (e.g., speech which meets Van Riper's criterion) into language handicap (manifest disruptions of the teaching-learning process), a conversion which would modify the figures on incidence considerably. This step, which might profitably be applied to all figures derived from school populations, would add a degree of refinement.

Of more direct interest have been the studies of language processes. A series of investigations have examined the abstract/concrete gradient in the vocabulary of retarded children. Badt used the vocabulary of the Binet Scale and developed an "abstraction score," which was negatively and significantly correlated ($p<.01$) with length of residence in the institution (2). Bijou and Werner employed fifty-seven words from Thorndike's list (12). Brain injured and non-brain injured subjects differed in modes of definition. After developing a system for classifying definitions on normals and psychotics (29), Feifel applied it to children and found that more mature children made greater use of synonyms and explanations in definitions (30). Griffith and Spitz studied the process of developing abstractions in twenty-six retarded boys (41). They found that desired abstractions in meaning were facilitated by prior use of the same process.

The syntax of language in the retarded is a fruitful area of study. Samples of language were examined by Carlton and Carlton (17, 18). In a study not distinguished by its attention to ecological factors they analyzed grammatical errors of normal and retarded children. The distinguishing feature of oral language in the retarded children was their failure to match verbs and their subjects.

Extended samples of language have been the object of inquiry in deaf children, and the work of the Heiders' is an illustration now some two decades old. Subjects other than the deaf have been used (28), and on occasions retarded children have been the object of inquiry. Type/token ratios and similar measures advocated by Johnson in 1944 (47) have slowly been applied to assess classes of words and to measure verbosity and repetitiousness. The studies of Mein (74, 75, 76), Lyle (64, 65), and O'Connor (80) in England, and Siegel (106) and Siegel and Harkins (107) in the United States have been recent examples of the value of this approach to language. In a representative study Sievers and Essa examined the structure of language in seventy-four institutionalized children and seventy-four matched subjects living in the community (108). They found that the use of pronouns, verbs and prepositions increased with advancing mental age while the proportion of nouns dropped. Recently, Wolfensberger, Mein, and O'Connor examined the language structure of eighty retarded persons between IQ 18 and IQ 49 (127). Verbosity was studied using type/token ratios and was related to mental age. Words were defined as "core" vocabulary when used by over fifty percent of a group of patients. Fringe words, that is all others, were found to increase more rapidly than the core vocabulary. Complementary studies in the same program of research are reported by Mein (74) and Mein and O'Connor (76).

Mein found that the progressive drop in nouns found in the oral language of normals was paralleled in retarded persons (74). Mein and O'Connor analyzed the 28,732 words produced by eighty retarded persons between CA 10 and 30 (76). The vocabularies of individuals whose MA's ranged from 3 to 7 varied in size from 106 to 677 words. Altogether, 2,419 different words were produced by the subjects. Repetitiousness of vocabulary has been reported from the Columbus State School as less common in retarded children living in the community than in those living in the institution (67).

The measures referred to so far are among those described in Johnson's 1944 monograph on the evaluation of language (47). Many had been used routinely before (21, 113, 130); not all of them have been used since. The adjective-verb quotient which has a long history does not seem to have been applied although Boder reports claims for its value as early as the 1920's (14).

The length of verbal productions has been employed as a measure of language (72, 94, 107). It has been used to assess the outcomes of special class segregation (50), the effects of speech therapy (72, 95), and the consequences of institutional living (96, 108, 127). It is a relatively unused measure, and its correlates do not seem to have been fully explored.

An equally neglected, but more important, formulation of language merits attention. In addition to its syntax English possesses a morphology. The child who believes that the opposite of "nowhere" is "yes-where" has made a significant discovery about the rules of morphological change, namely their variety. Berko has pointed to the probable relevance of mental maturity for children's progress in morphology (8). There appears to be no extant work paralleling Berko's 1958 study of morphology in young children of presumed normal intelligence. Investigation of growth in morphology by retarded children does not seem to have been undertaken.

Phonemes have been studied infrequently. Irwin's program of studies on speech development in infants has included retarded children (45), and he has reported on the speech sounds of ten young children with a mean IQ of 29. They used front rather than back vowels, and he described their speech development at about age four as similar to that of normal children less than one year old.

The neurophysiological basis of speech has not been studied in great detail. Meader based a theory of speech development on the "hypha," which was described as "the smallest physiological unit of speech," (71). Two investigations, those of Schlanger (94) and Davis (20), have used diadochokinesis as measure in their analyses of speech in retarded and premature children. Another physical aspect which has been studied is pitch. Michel and Carney analyzed pitch characteristics of mongoloid boys (79).

Language as cognitive process has received some attention. Rigrodsky and Goda examined expressive and receptive processes and found that great variability existed in a group of brain-injured children (86). Generally those who were more advanced receptively were also advanced expressively. In recent years the study of linguistic cognitive processes has advanced through the theoretical foundations described by Osgood and Wepman. Sievers and Essa (108), and subsequently Kirk and McCarthy (55), have applied their scales to retarded children with profit.

Subjects. The subjects used in the various studies have been classified in many ways. Severity has been a common dimension with children grouped by IQ and less frequently by IQ and MA (1, 6, 60, 64, 92, 115). Institutionalization has been used on many occasions (64, 65, 80, 81, 86, 93, 127) although only Schlanger seems to have viewed the condition as separation from the home (96). In general, institutional living has been tolerated although Wolfensberger and his associates believed that their institution in Britain need not be a depriving milieu (127). Lyle has combined subjects in several ways in studies reported in 1959 (64). Working with moderately retarded children, he classified them by place of residence--e.g., institution, home, or special nursery school--while also using disease for subsidiary analyses.

Retarded children have been studied by clinical syndrome. Mongolism (33, 39, 57, 74, 79, 97, 100, 116, 123) has been used, as have cerebral palsy (16, 23, 25, 14, 17, 87, 126), prematurity (20, 44, 53), phenylketonuria (24), epilepsy (34), cretinism (103), and brain injury (12, 28, 33, 68, 87, 99, 122). Age has been used in several ways (35, 41, 96, 125), and most studies describe children as educable or not although this has not generally been a primary basis of classification.

Experimental Design. Many studies are normative surveys and give descriptions within defined limits, such as the site of the study, the clinical entity involved or age. Heterogeneity marks the subjects, and in some instances it seems to have been avoidable. Matched groups have been commonly employed but with infrequent use of language status as the discriminating attribute. The studies reported from Kansas in 1963 have been an exception to this trend (92). In the last several years factorial designs have appeared, and sophistication seems more apparent. Correspondingly, clinical reports have been infrequent, and longitudinal studies have been quite rate.

LANGUAGE AS AN ISSUE

It is apparent that attention to language in the retarded has increased over the years. Reviews of the literature have been more common, within the last decade (66) and the last five years in particular, producing several relevant commentaries (37, 43, 69, 110, 114, 124). Undoubtedly this trend will continue. We may also expect to see more studies of language as cognitive process as a result of Kirk's work on the Illinois Test of Psycholinguistic abilities (55, 110, 111). Such developments are common; Taylor's anxiety scale led to studies on that topic a decade ago, and that catalytic process will probably be repeated in psycholinguistics.

A desirable development would be the infusion of contemporary ideas on learning into the development of language. In the basic sense this might take the form of applying the Skinnerian paradigm to speech development and the speech therapy. The Parsons Language Sample will probably accelerate basic behavioral studies of language (92). In a technological sense programmed learning is certainly relevant to teaching language. The application does not seem to have been made in order to benefit those who would profit most, the retarded, or indeed the aphasic from whom language has been taken.

A more general need is the definition in functional terms of what a child is, whether retarded or not. For several years the writer has been struggling with the development of models of classroom process and of the learner within that process. Specification of what a learner is would allow us to categorize criterion measures and to infuse ideas from one behavioral discipline into another. As an example, it is capricious that type/token ratios should have been standard linguistic measures in studies of the deaf, but have remained relatively ignored in studies of the retarded.

In summary, it appears that language processes merit attention in refinement of the concept of mental retardation. More precise constructs are needed to facilitate thought on the problem, and it will only be after a great deal of hard but fascinating work that our sophistication in the area will develop. Undoubtedly language constitutes one of the prime dimensions of intellect in human beings. The relationship stands as one of the great challenges in mental retardation.

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Discussion following Jordan's paper

Jordan's review of the literature concerning speech and language of the mentally retarded called attention to the shift of emphasis from descriptive studies of this population to recent experimental research measuring the effect of various therapeutical and developmental programs. Questions arose concerning the optimal ways of measuring such changes, and the functional meaningfulness of such statements as "improved articulation", "increased language age", "significantly improved encoding", etc. Further discussion focused on the continual need for development and extension of such overall language measures as Kirk and McCarthy's _Illinois Test of Psycholinguistic Abilities_ and Spradlin's _Parsons Language Sample_. Specific changes measured by these instruments need to be related to consequent behaviors demonstrable in other ways as well. The comment was made that further validity information for such instruments is needed.

The overall problem of goals or objectives for the therapist or language developmentalist working with retardates remains a very real problem. Such issues as the impracticality of "perfect speech", or the programming of specific subgoals for the child of retarded mental development remain important, but relatively unattended to, in the literature.

Several participants questioned whether or not speech therapists and/or teachers of the mentally retarded were sufficiently trained to devise meaningful programs of speech therapy and language development for the mentally retarded. Jordan's paper seemed to indicate the feasibility of language development programs, but offered little evidence to suggest that such programs are being developed.

Conference on Planning Research on the Mentally Retarded Child

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__Neurological Approaches:__

The invitation to participate in this conference came at a time when, at first glance, it seemed most inappropriate both for me and for the conference. I had just completed a manuscript for presentation at a conference on minimal brain damage, in which the thesis I espoused was in effect a comparison of the effects of brain damage versus cerebral agenesis as the cause of learning problems in children. I then upheld, and still do, that for most retarded children, whether the emphasis of their retardation is in the intellectual domain or in language acquisition, the generalization of brain injury from behavior without positive neurological sign is untenable, and that a more useful concept was failure of neural development, or agenesis. That argument is not in print, and the reasons given are available in the publication of the Conference (2).

To then accept an invitation to explore neurological approaches to mental retardation seemed anomalous--not that cerebral agenesis is not in itself a neural etiology, but that for the most part in the non-physically handicapped retarded child the evidence for neurological damage with specificity of dysfunction implied is true of relatively few children. It is the atypical, rather than the typical, diagnosis. It is of far greater importance, it seems to

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me, to study the behavior of the retarded rather than to search for the ever elusive cause until we can demonstrate that etiology plays a significant role in the learning capacity or learning potential of the child.

As I thought of this, however, it appeared to me that perhaps the most useful contribution to research in this area might well be in full consideration of this very factor, the presence or absence of demonstrable neurological lesions; whether in the population studied for any facet of cognition, verbal or non-verbal, language or non-language, an essential parameter should not be the presence or absence of demonstrable neurological damage. To illustrate this point, and thereby emphasize its importance, specific research we have undertaken to establish clinically useful diagnostic procedures for the differential diagnosis of language impairment in children is based in part on the predication that discernible differences will obtain if the population studied is viewed from the etiological viewpoint; to wit, whether the children have a positive neurological deficit or not. It is predicated from clinical evidence, that in the language behavior of the children with certain explicit exceptions, no differences will be found. However, this is yet to be proven. The overt non-language behavior, it is thought, may well differentiate the two groups while the language disability may not. For example, it is widely accepted that a counterpart of neural trauma in behavioral terms is to be found in the lack of control, the lack of inhibition and the inconsistencies of behavior such children demonstrate. The non-brain-injured child, on the other hand, may show an equal ineptitude in vocabulary usage or comprehension, but usually will be less volatile -- in fact, may even be passive in most situations.

As a first recommendation for a single parameter in research design for the mentally retarded, then, I would strongly urge that the neurological deficit be recognized and that the interpretations made from the research be made in terms of children with known deficits, as compared with children whose etiology does not indicate specific neurological trauma.

At the conference mentioned, one piece of research was reported which related the findings on a retarded population of two professional disciplines - neurology and psychology. Each studied the same children supposedly from their own idiosyncratic viewpoint. In this study, the neurologist and the neuropsychologist arrived at remarkably similar findings. It was pointed out that while two independent evaluations were involved, the children being studied differed markedly in the presence or absence of positive, demonstrable neurological signs. It became evident in the discussion which followed the paper's presentation that the neurological examination and the diagnostic decisions based on it relied as much, if not more, on the behavior of the children as on neurological signs. Or, in other words, both disciplines were using the same behavioral criteria in arriving at their decisions, and in consequence, were sure to arrive at similar nosological grouping. As an aside, it might be noted that in many instances the psychologist was making his decisions frequently on what could be described as neurological signs. Thus, the patient's gait, psychomotor activity, history of seizures, tremors, etc., rather than the purely psychological signs of the evaluation procedures were reported.

The conclusion drawn from this is no argument for or against neurology or psychology, but rather that, for the neurologist, decisions regarding the presence or absence of neural deficit should be based on observable and demonstrable neurological signs, not upon the observations of behavior. Conversely, psychological determinants should be based on psychological evidence and not upon neurological signs.

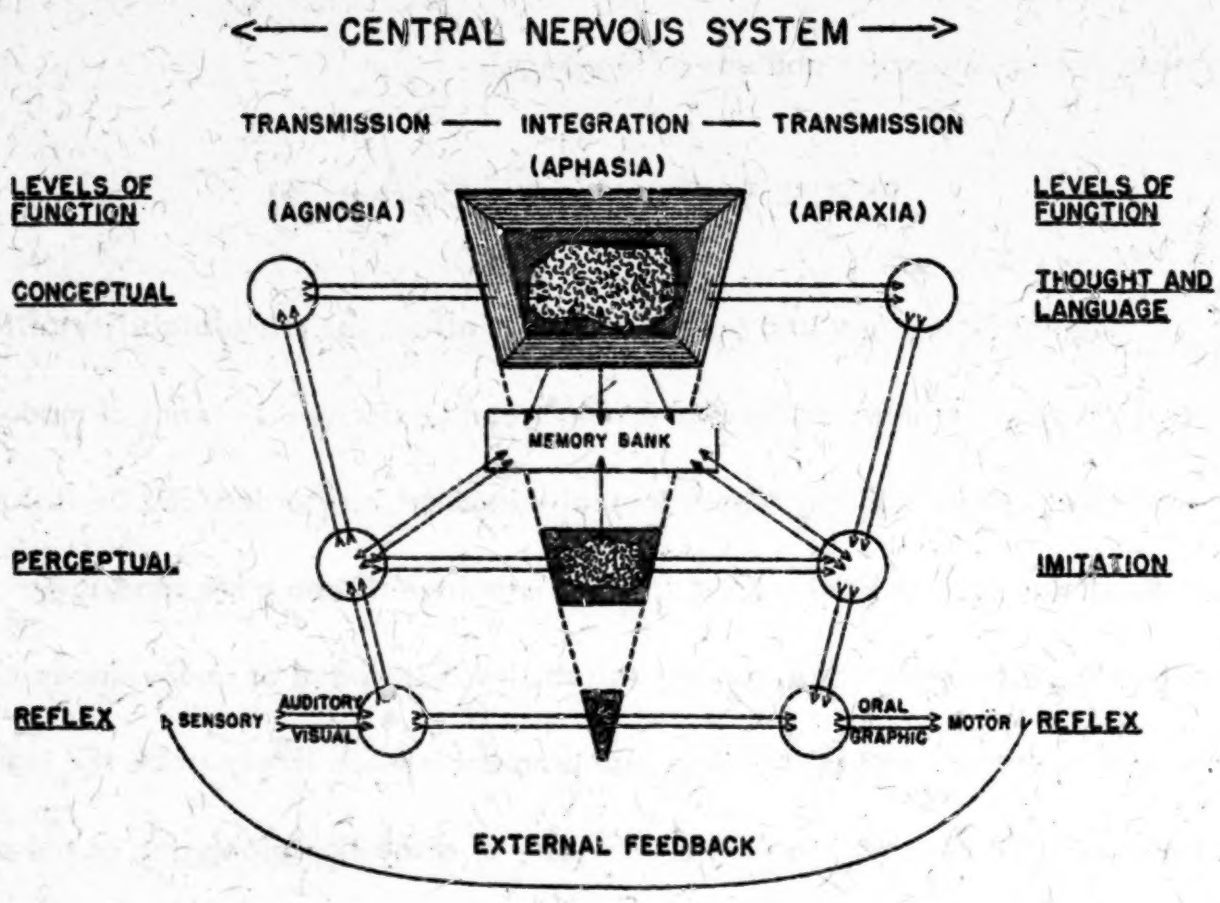
This, then, would be my second recommendation to the conference. It is perhaps best seen as a sub-recommendation to the first one. When populations of mentally retarded are studied and neural etiology is to be used as one of the independent variables, then the decision for placing children in one group or the other should be based on neurological rather than behavioral signs regardless of who makes the determination, the neurologist or the psychologist. The converse should of course be equally true relative to the psychologist and behavioral indicators.

Within the domain of the neurological deficit itself, a series of recommendations for research seem evident. They perhaps can be subtended under a single topic, the concept of neural function held by the researcher. For example, it is well known that the brain, the organ of thought, the mediator of behavior, is under stated when it is said to be a most complex organism. It is imperfectly understood both from the viewpoint of its organization and even its location. For the present speaker, dysfunction of the brain in the mentally retarded is accepted as being of at least two varieties: there may be very specific lateralizing perceptual disabilities affecting unique input or output processes, or there may be very generalized disabilities affecting all cognition. This construct is especially useful in the consideration of my own area of greatest interest, the development and use of language.

FIGURE 1. The Modality Concept (5)

The specific input and output pathways affect the stimulatability of the central process. When a particular problem can be defined in terms of modalities where visual versus auditory versus tactual-kinesthetic disorders can be isolated, then brain damage, or better-named, brain impairment, can more readily be conceived. Where the total conceptual ability is retarded or undeveloped and no modality pattern can be elicited, the problem is more likely to be the result of agenesis. To be more explicit, specificity of disability along one or the other modality can be recognizably seen in study of the transmission of sensory stimuli or motor patterns due to localizing trauma, while generalized intellectual disability or the inability to learn or comprehend or use the incoming stimuli is more easily understood as a gross failure to develop. (Notable exceptions to this are easily recognized.) Where trauma produces massive damage affecting both hemispheres in all of their aspects of function, no differential diagnostic problem seems to be present. Such children usually have such a multiplicity of problems, so many anomalies of development and function that they are easily diagnosed as the multiply handicapped, severely retarded children. On the other

Figure I


CENTRAL NERVOUS SYSTEM
TRANSMISSION — INTEGRATION — TRANSMISSION
(APHASIA)
LEVELS OF FUNCTION
(AGNOSIA)
(APRAXIA)
LEVELS OF FUNCTION
CONCEPTUAL
THOUGHT AND LANGUAGE
MEMORY BANK
PERCEPTUAL
IMITATION
REFLEX
SENSORY
AUDITORY
VISUAL
ORAL
GRAPHIC
MOTOR
REFLEX
EXTERNAL FEEDBACK

AN OPERATIONAL DIAGRAM OF THE LEVELS OF FUNCTION IN THE CNS hand, where the learning capacity, the function of general comprehension and use, is affected without multiple anomalies, the most parsimonious explanation is agenesis. With this distinction in mind, the exceptions can be studied holding constant the positive neurological indicators mentioned earlier.

One such exception occurs in language development, for example. The onset of speech may be delayed, it is held, due to auditory imperception -- including such auditory perceptual factors necessary for accurate speech production as auditory discrimination, memory, and sequential behavior where no specific trauma can be elicited. Thus, lags in development may be seen along quite specific modalities. Language, or the ability to formulate, comprehend, and use verbal symbols, may progress relatively unaffected by such perceptual disabilities within prescribed limits. Thus, the deaf child comprehends language obtained visually; and the blind child comprehends, thinks and functions with auditory signals even though he possesses no visual discrimination, memory or patterning ability. The conceptual level, then, may be unaffected whereas the perceptual mechanism within the total neural construct may be impaired along one or another modality. This is not to say that a block in transmission along a modality does not affect conceptual behavior--indeed it does--but the impairment is limited and largely affects the ability to conceptualize, i.e., less stimuli reaches the central process for integration, and there is a real delimitation of the associations to specific acts of conceptualization. The aurally imperceptual child has only visual and tactual-kinesthetic associations upon which to base his concepts. As a result, his cognitive ability cannot fail to be delimited and to suffer.

My third recommendation to the conference, then, follows from this concept of neural organizations. Research should isolate the defect in the retarded--first to determine whether the problem is seen as a demonstrable neurological impairment, then to determine whether the problem is perceptual or conceptual in nature. In case of the former, the question arises as to where and to what degree the modality in question is limited, and how much of a role this delimitation plays in the acquisition of new learning? And, how much adaptation can be made by compensation through the use of unimpaired pathways? If conceptual abilities are affected, and not the lower level perceptual functions, the research can point to the specific areas where making use of perceptual learning may increase the efficacy of the more complex conceptual functions.

Let us be specific here to the language act. If speech accuracy is not a problem in a given retarded child, the assumption can be made that the auditory pathway at the perceptual level is not seriously affected. If in the same child, language acquisition is delayed, then it is reasonable to assume that the higher levels are affected, the levels of language and thought. Such defects of function will produce concentrated delays in verbal acquisition. Comprehension and use of vocabulary will be delayed. It is necessary then to study how increased perceptual auditory training may assist the child in overcoming his conceptual defect.

Considerable research of a very useful nature has been established in this regard. One serious lack is seen, however, which points to the need for more exhaustive study on a wider plane. McCarthy and Kirk (3) have demonstrated the usefulness of the modality construct following Osgood's model of neural function, which is so like the model developed independently by the speaker that, when both models were originally presented at a conference in Boston in 1959, it was seen that they could well be substituted one for the other. (4)

In the I. T. P. A. which was developed following the model, the tasks presented and the protocols derived showed a reasonable first step in assessment of pre-linguistic characteristics of learning with some less adequate measurement of the linguistic factors.

Frostig (1), approaching only the visual-perceptual task, also has been able to demonstrate that a variety of pre-linguistic characteristics in learning may suffer from impairment of that modality.

The relationships between these pre-linguistic factors and the linguistic processes involved in the acquisition of language should be studied at some length and with considerable rigor. While this has been attempted by both test constructors, the results are inconclusive both for the normal child with lags in development and for the brain-damaged child with modality involvement. Another lag in our understanding of the shift from the lower level perceptual learning to the higher mental processes related to our earlier recommendation relative to the demonstrably brain-injured child and the impaired learner without known brain injury. Do they function alike in their development of concept formation or should they be considered as separate types of learning problems requiring different approaches?

Research in linguistic function in brain-injured adults has shown differential abilities of aphasic patients to utilize their decoding and encoding of semantic, substantive words from their use of the highly frequent function words. Do such differences exist in the brain-injured, mentally retarded child? Or, in the child with agenesis? Are they able to acquire syntax, but fail in acquiring the semantic aspects of language? Look for a moment at a parallel between children's acquisition of language and the adult aphasic classification that comes from our psycholinguistic study of aphasia.

TABLE 1

Comparison of the Development of Language and the Five Aphasias

STAGES OF DEVELOPMENT	STAGES OF APHASIA
1. Speechlessness	1. Global
2. Babbling - cooing - jargon	2. Jargon
3. Fortuitous speech	3. Pragmatic
4. Substantive symbols	4. Semantic
5. Grammar	5. Syntactic

Can specific mental retardation be described as an arrest at one or another of these developmental states -- these stages of the acquisition of linguistic processes?

A final brief comment on language research relative to the mentally retarded child. One of the problems in studying language and speech development for any experimental group is our lack of knowledge about verbal acquisition in normal, unimpaired children. Partially, this is due to the tremendous problems inherent in such a data collection project.

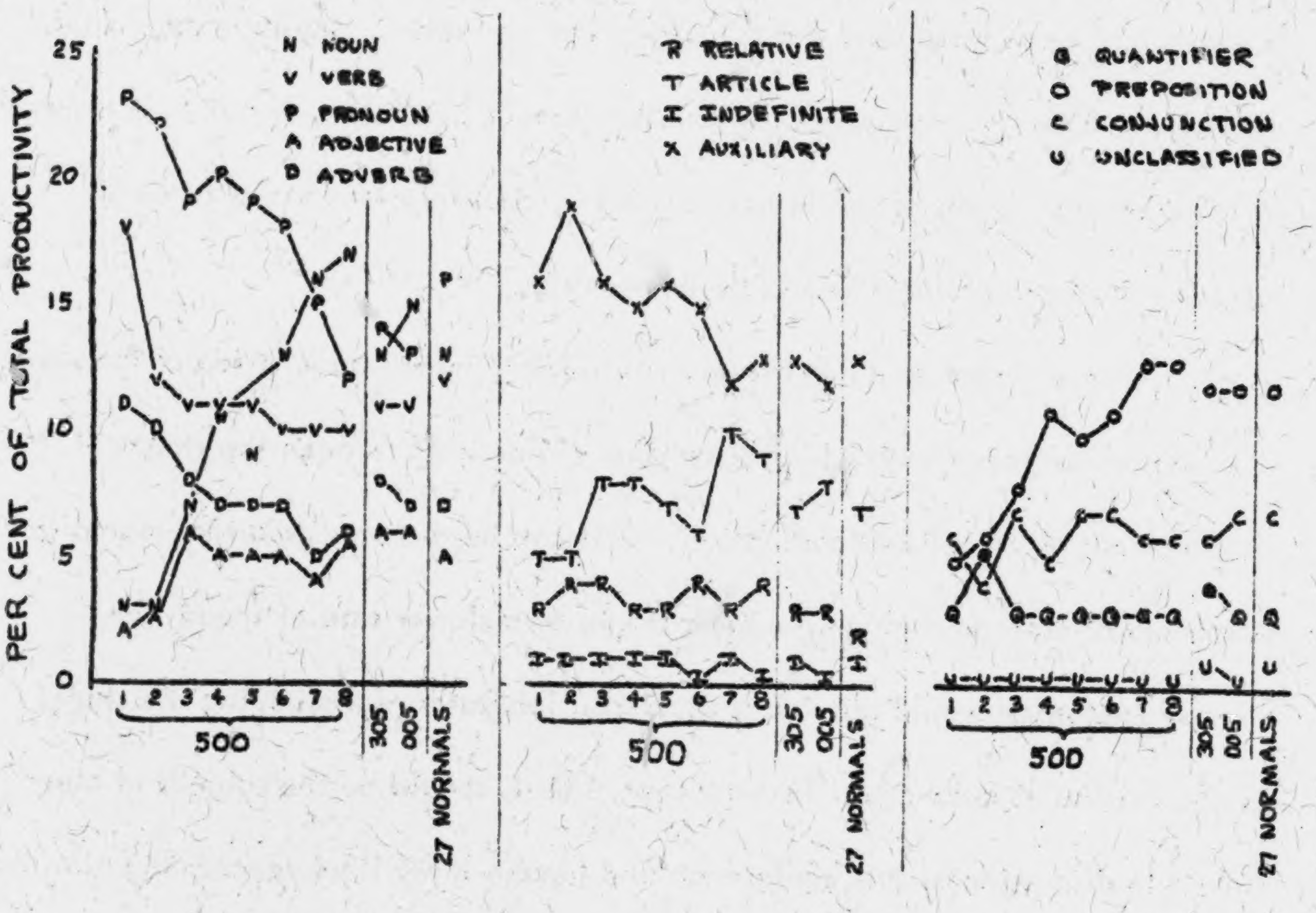
FIGURE 2. Analysis of Eight Records of an Adult Aphasic Patient

We presently have in mind, in this regard, an extension to children of our collection of data on adult spoken language where the relative frequency of use and the part-of-speech of each word used are the dependent variables. A pilot study in this direction is already under way. When such data is available, certainly a comparison at different age levels of the language used by different levels and types of mentally retarded children would be in keeping.

Another facet of the difficulty in studying normal acquisition of language is the remarkable speed with which some such children go through the stages of development of verbal communication. If it can be demonstrated that mentally retarded children go through the same stages at a slower rate of speed, the mentally retarded would provide a wonderful laboratory for studying the stages of acquisition of language. This concept, I feel, should be the subject of considerable discussion at this conference and I make it my final recommendation that we explore its potentials at some length.

In summary, then, the following specific recommendations are made to the conference for discussion purposes:

1) That the potential neurological deficit in mentally retarded children be recognized and that interpretations derived from the research be made in terms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of the known neural deficit in contrast to that part of the population studied whose etiology does not indicate demonstrable neurological trauma.

2) That the various workers (Neurologist, Psychologist, Language Pathologist, etc.,) studying the mentally retarded express their findings in terms of their own disciplines and not in terms of disciplines with collateral interests.

3) That when neurological trauma or deficit is considered, it be stated in terms of the concept of neural function espoused by the researcher.

For this researcher, for example, this would mean expressing findings in terms of his concept of differential levels of function, perceptual and conceptual, and differential aspects of the input-integration-output trichotomy of neural function. Perhaps we could add that an explicit differential could be stated between speech and language studies as one means of deriving more specific information.

4) That the application of verbal language parameters in terms of frequency and part-of-speech categories be made to the study of the mentally retarded child.

5) That research into the links between prelinguistic and linguistic function be studied both in speech and language. This recommendation, of course, carries with it the corrollary which is mentioned only to place it on the record: that a distinction be constantly maintained between studies of speech and studies of language. Too frequently, it is held, these two are confounded, and the results are evident.

6) That the comparative stages of language development of mentally retarded and unimpaired children be studied to determine if the slower progress of M/R children provide advantages for describing language acquisition.

It is with these recommendations that I feel the conference can discuss neurological approaches to the study of mental deficiency, especially in regard to language and speech development.

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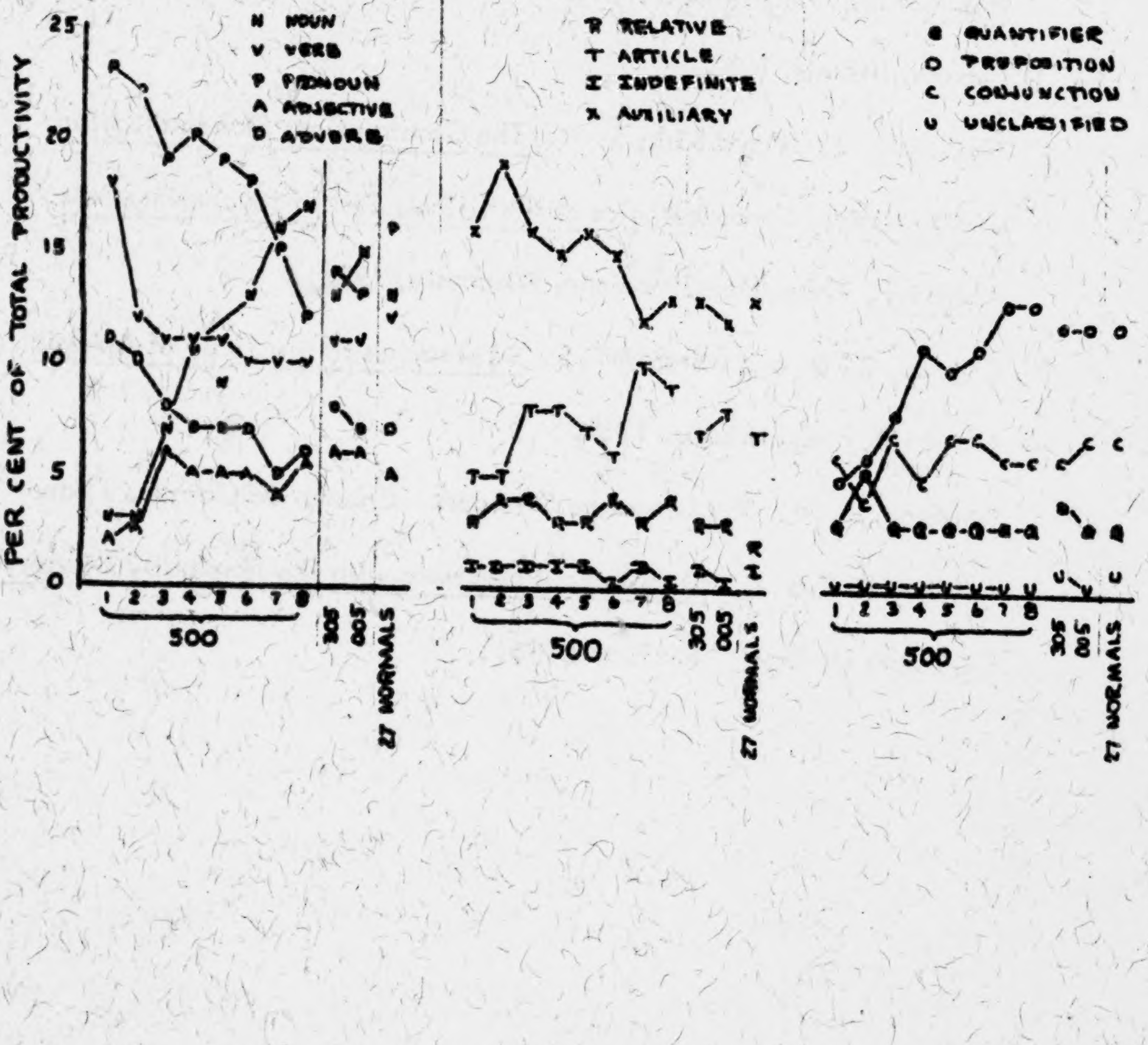
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Discussion following Wepman's paper

Immediate interest in Dr. Wepman's reference to his pilot study of adult normal and aphasic speakers led him to elaborate on that part of the paper. He explained the system used for part-of-speech classification, its rationale, the procedure for obtaining samples of free speech (responses to the Thematic Apperception Test), and methods of data analysis (Jones, Goodman, and Wepman, 1963). This study, in comparing the taped protocols of aphasic and normal speakers, demonstrated the differences between normal and aphasic populations, as well as psycholinguistic differences within aphasia categories. Wepman stated that their results, thus far, indicate that 80 to 90% of the speech of normal speakers (educational level 8th grade through college) can be accounted for by less than 500 words. It was felt that such analyses of the speech of mentally retarded populations by age groups and intelligence levels should prove very fruitful. However, several participants recalled that the limitations placed on the vocal output by the stimulus (TAT cards) must be reckoned with. It was suggested that other situations, pictorial stimuli, etc., be used to find if the vocal output is greatly affected by change of stimuli or reinforcement program. Analyses of the retardate's pertinent life situations (personal, social, vocational) might suggest a nucleus, or "core vocabulary," which would account for 80 - 90% of the retardates expressive needs. Wepman also suggested the importance of obtaining information on the development of speech habits in normal children, using the same proposed system of part-of-speech classification.

This would allow a linguistic breakdown of the retardate's speech in relation to the normal child's product.

Further time was spent exploring the word classification program and the computer analysis system used by Wepman in the earlier reference.

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Procedures for Measuring or Evaluating Language

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The term "language," as commonly used, refers to a conglomeration of events ranging from gestures to heiroglyphics. However, within the present context language will refer to the speech and gestures of a speaker and to the responses to speech and gestures made by a listener.

Quantification of language can be considered a series of steps in which responses are sampled, classified, and counted. While language might be sampled in many different situations, the language responses of retardates have most frequently been sampled in a dyadic situation with an adult examiner. This fact presents no particular problem if these language responses are representative of those about which one generalizes. However, if samples of language responses obtained in such dyadic test situations are not representative, what appears to be a body of knowledge about the characteristics of the language of mental defectives may be valid only for mental defectives in test situations. In other words, the body of knowledge may have limited applicability. This is a problem which those who study language should consider seriously.

Regardless of how language responses are sampled, the problem of classification arises. Certain classifications such as gestural versus vocal responses can be made on the basis of the physical characteristics of the responses alone. Other classifications involve some other type of evaluation of the response.

Evaluative classifications always involve a comparison between the language response to be classified and other language responses.

One system of evaluation is based on the comparison of the subject's response with the responses of a normative population to a similar situation. If the subject's response is commonly given by individuals of a normative group, it is classified as "correct" or "appropriate." If the subject's response occurs quite infrequently, it may be classified as incorrect or inappropriate. When the basis for classification resides in the frequency with which the response is encountered in a normative group, the criteria for correctness or appropriateness are entirely independent of the subject. It makes no difference how consistently the subject emits a given response in a situation; what is critical is how frequently the norm group responds in that manner. Thus, the fact that a subject consistently substitutes the sound "g" for "d" in the word "doll" does not make the response "goll" any more correct if such a substitution occurs infrequently in the norm group.

In other systems of evaluation the consistency with which a subject makes a given response in a situation is an important classification determinant. This is true with reference to the concept of intelligibility. Intelligibility can be specified in terms of a two-person situation in which a listener is required to perform some task on the basis of the language behavior of the speaker whose intelligibility is to be assessed. The more accurately the listener performs the task (such as repeating or carrying out instructions), the more intelligible is the language behavior of the speaker. Initially the similarity or dissimilarity of the language responses of the speaker and persons with whom the listener ordinarily interacts (normative group) is a critical determiner of the listener's behavior. However, if the listener experiences the speaker's language behavior in many contexts repeatedly, the consistency with which the speaker uses particular language responses becomes critical. That is, even though a given language response such as "goll" may be extremely rare or nonexistent in a norm group, if the subject consistently makes this response when confronted with a picture of a doll and never uses it in response to other pictures, the word "goll" will become completely intelligible to the listener. In short, the frequency with which a speaker emits a response in a specific range of situations relative to the frequency with which he emits the response in other situations, in part determines the intelligibility of the response for a listener.

Some language measures, such as sentence length and type-token ratio, appear at first glance to be based on the physical dimensions of the responses alone. However, when one looks more closely, he sees that sentence length and type-token ratio are based on how closely certain sounds (words) and certain larger speech units (sentences) approximate the sounds and speech units of the community at large (norm group). Verb-adjective ratio and other ratios of one component of speech to another have the same basis.

Once language responses have been classified, obtaining the various language measures becomes a problem of counting and statistical manipulation.

Some scores are simply the sum of all of a certain type of response. For example, an articulation score is based on the sum of either all of the correct or all of the incorrect responses to the items of the test situation. The type-token ratio is simply the ratio of different response words to the total number of words in a fixed number of responses.

I will discuss some of the more frequently used procedures for studying language. The procedures can be classified as (1) reports of unsystematized observations, (2) judge or observer evaluations of speech on language behavior in an unstructured situation, (3) standardized test procedures, and (4) measures derived from transcripts of tape-recordings.

Reports of unsystematic observations by parents, teachers, and attendants have been used quite widely in clinical studies of the language development of retarded persons. These reports have been used to evaluate both the current and the past status of the retarded person. Such unsystematic observations have been used on the rationale that persons in daily contact with the retardate are able to base their judgments on a much larger sample of behavior than is the examiner in a test situation. Moreover, the procedure may provide information which can be obtained in no other way. For example, these techniques have been used in an attempt to determine when the person said his first word, used sentences, recognized parents, etc. Even current behavior may be somewhat difficult to obtain in ways other than acceptance of unsystematic observation. For example, the report of the parent may be the easiest way of obtaining information concerning the child's language behavior at home, in the grocery store, or in community social settings.

Usually measurements based on unsystematic observations have been limited to very gross behavioral situations. However, Mecham elaborated on the items of the Vineland Social Maturity Scale in an attempt to obtain reports of unsystematic observations in a systematic way. The Mecham Scale consists of 50 items ranging from item 1, "crows, laughs, or smiles," to item 50, "follows current events and discusses them with others."

Persons doing studies involving such reports by untrained observers have frequently taken the reports at face value. They have rarely checked the reliability and equivalence of either the examiner obtaining the reports or the infomant giving the reports. Since the procedures for obtaining reports from informants are rarely systematized and procedures for scoring reports rarely explicit, it is hard to imagine the beliefs and hypotheses of the examiner not having an effect on the data obtained. Finally, there has been little effort invested in checking the relationship between reports and the events supposedly being reported. This is understandable since if direct systematic observation of the reported language events could be easily and readily obtained there would be no need for relying on such questionable data as reports by untrained observers.

Judge and observer evaluations are frequently made when the investigator wants an "evaluation of a rather complex language process." One of the most recent attempts to use judges to evaluate language was by Lassers and Low in their San Francisco Inventory of Communicative Effectiveness (SFICE). The measures of the SFICE were derived from tape recordings of a child's performance in an interview situation. Judges rated the tape-recording of the child's response in the interview on immediacy, frequency, enthusiasm, involvement, ease in social situations, understandability, articulation, average length of response, appropriateness, complexity of ideation, and overall communicativeness. After a rather elaborate system of judge training, the median reliability between judges ranged from .61 on appropriateness to .80 on overall communicativeness.

Judge ratings, either of live or taped communication, allow for a type of flexibility of use that the standardized test does not. While standardized test procedures are usually limited to evaluating the speech and language of the examinee with a rather formal adult test examiner, the judge or rater can evaluate a person's language in a variety of social situations. Thus, results from this procedure might have a rather wide applicability. However, a closer look at judge or rater evaluations raise serious questions concerning the use of such procedures in research. First, the reliability correlations ranging from .61 to .80 are low; but even if they were high there is a question of whether the ratings of the judges tell us much about the specific characteristics of the person's language responses. Rather, they tell us whether this person's language responses can elicit a given kind of response in a listener. Moreover, the listeners or judges may be extremely unique as a function of what is probably a non replicable training procedure. In brief, it is unlikely that the procedures of judge evaluation can be readily communicated to the rest of the research community.

By standardized test procedures I am referring to a situation in which an examiner presents a series of items to the examinee and then records or scores the examinee's responses in the test situation. Standardized test procedures are, perhaps, the most widely used procedures for studying language. These procedures range all the way from a standard audiometric examination to the procedures used by Berko in studying the morphology of children's language.

The first standardized test procedures which I will mention are related to the examinee as a listener. Several tests have been devised to evaluate sound discrimination in normal and retarded persons. These tests usually involve a standardized set of auditory stimuli which are presented either directly by the examiner or by a tape recorder. The subject is then required to make a simple motor response such as pointing at a picture. Mecham--as well as Lindsley and Schiefelbusch, Schlanger, and others--have developed sound discrimination tests.

Mecham's stimulus materials for his sound discrimination measure consisted of 86 cards. Three pictures were mounted on each card. While viewing the pictures, the subject was presented three tape-recorded words through earphones. One of the words was the name of one picture. The other two words were acoustically similar to the names of the other two pictures. For example, the words "feet, fun, money" might be presented while the subject viewed pictures of a seat, sun, and money. Pointing to the picture of money constituted a correct response. The odd-even reliability was .95 for thirty-one 9- to 18-year-old institutionalized mental defectives with IQs between 41 and 81.

A second test of listener activity is illustrated by Dunn's Peabody Picture Vocabulary Test (PPVT). The PPVT can be considered an auditory word comprehension test consisting of 150 plates with four pictures to each plate. For each plate, the examiner says a word and the child is to indicate to which picture the word refers. Both age equivalent scores and vocabulary quotients are provided. Alternative form reliabilities for the vocabulary quotients of the PPVT range from .67 at the 6-year level to .84 at the 17- and 18-year levels. Since the procedures used for calculating reliability partials out most of the variance associated with age, such correlations are impressive. The alternative form reliability was .76 for 130 noninstitutionalized 7- to 15-year-old mentally retarded children whose IQs on the Revised Stanford-Binet Form L (RSB-L) ranged from 50 to 80. Alternative form reliability of the PPVT was .87 for 364 noninstitutionalized 6- to 16-year-old mental defectives with IQs between 30 and 50.

The sound discrimination and the picture vocabulary tests are spoken of as involving the person primarily as a listener since they require no speech and a minimum of gestural responses. This fact by no means is meant to indicate that listening is unrelated to speaking. The very fact that Dunn is able to obtain a .76 correlation between PPVT scores and Stanford-Binet scores for an institutional group indicates that the listener-speaker functions are related. While considerable work has been done on test reliability, I know of no work on the PPVT which systematically investigates examiner constants or biases.

We shall now turn to evaluations of speech or output in a standardized test situation. One of the most frequently used speech measures is articulation accuracy. Siegel (1962) studied experienced and inexperienced articulation examiners. His results are quite relevant to an evaluation of articulation measurement. Four adults, "two experienced and two inexperienced," administered and scored the Templin-Darley 50 item screening test on three occasions, each with approximately 20 mentally retarded boys between 8 and 14 years of age. Examiners marked only whether a response was correct or incorrect. It is interesting to note that while the correlations between examiners ranged from .80 to .97, 16 of 18 comparisons between examiner means were significant. That is, while examiners ranked subjects similarly for articulation, they also showed examiner constants or biases.

Berko (1961) developed 27 items to study children's knowledge of morphological rules. The 27 items evaluated children's ability to make plural and possessive of nouns, the third person singular of the verb, the progressive and the past tense, and the comparative and the superlative of the adjective. Berko reasoned that if English words were used to study the morphology of children's language one could not be sure that the child was acting according to a rule or had simply learned the particular form by having heard it used or by using it. However, by using nonsense items one could be sure if the child provided the conventional word endings that the child was operating according to rules or making a generalization. An example of Berko's procedure follows: The examiner would present a picture of one bird-like figure, then two. The examiner would read the typewritten statement under the pictures. Under the one bird-like figure was the statement, "This is a wug." Under the picture of two bird-like figures was the typewritten statement, "Now there is another one. There are two of them, there are two ____." Preschool children responded "wugs" 75 per cent of the time while first grade children responded "wugs" 97 per cent of the time. No data are given on reliability or examiner equivalence of results. However, there are rather clear differences between adults, first grade children, and preschool children.

While most of the tests of language have been aimed primarily at the use and understanding of spoken language, Goodglass and Kaplan (reported in Osgood and Miron 1962) have developed a Gestural Communication Test. This test distinguishes five levels of gesture and pantomime interaction. They are:

1. Pantomime interaction. For example, the examiner offers the examinee a box (does he accept ?). Then the examiner points to the box in the examinee's hands and taps the table (does the examinee set the box down?)

2. Natural expressive gestures. This subtest consists of items for testing gestural understanding (decoding) and for testing use of gestures (encoding). For example, the examiner might hold his nose as if to indicate a foul smell and ask the examinee what he was doing or he might ask the examinee," Show me how you would indicate that something stunk."

3. Conventional gestures. These are such highly stylized gestures as saluting, Churchill's "V" for victory or thumbs down. These are presented as decoding, encoding, or imitation tasks.

4. Simple pantomime. Here the physical properties or actions of objects are described. Once again these items are presented for comprehension, imitation of use.

5. Complex pantomime. These usually refer to complex causal sequence of events. I have not located the original source for the Goodglass and Kaplan test, however, Osgood and Miron report the subtest intercorrelates from .50 to .70. The population was unstated but presumably was aphasics. No data is given by these authors on reliability or examiner equivalence.

Within the last ten years there have been at least two attempts to develop language tests based on learning models which would sample a wider area of both speaking and listening activities. Kirk and McCarthy (1961), using Sievers' (1955) work as a springboard, developed the Illinois Test of Psycholinguistic Abilities (ITPA). As was the case with Sievers' work, Kirk and McCarthy's rationale has been drawn primarily from the work of Osgood (1953). According to the rationale used in developing the ITPA, there are two basic modes of input (visual and auditory) and two basic modes of output (vocal and gestural). There are two levels of organization--the automatic sequential and the representational; and there are three psycholinguistic processes--decoding, association, and encoding.

According to Kirk and McCarthy, at the automatic-sequential level of organization, language is primarily imitative and sequential. At the representational level language is *meaningful*. For example, the child learns to say, "da da" in the presence of the appropriate stimulus.

Decoding, the authors state, refers to the ability to obtain meaning from visual and auditory stimuli. Association is the ability to manipulate linguistic symbols internally. It is a central process which is elicited by decoding and which in turn elicits expressive processes. Encoding is the sum of those abilities required to express ideas.

The current version of the ITPA consists of nine subtests designed to differentiate defects in (1) the three processes of communication, (2) the levels of language organization, and/or (3) the channels of language input or output.

McCarthy and Kirk (1963) have made an extensive analysis of the data derived from 700 children between 2 1/2 and 9 years. Split half reliability data on the subtest range from .55 to .87 for 12 age groups and from .89 to .95 for the total population.

At Parsons we have developed procedures for sampling language (Parsons Language Sample, PLS) based primarily on the system provided by Skinner (1957). The PLS has two subsections, vocal and nonvocal. The vocal subsection consists of (1) the tact subtest, which samples picture and object naming; (2) the echoic subtest, which is a series of items requesting the subject to repeat sentences and numbers of varying degrees of complexity; and (3) the intraverbal subtest, which consists of items ranging from simple questions, such as, "What do we do when we are hungry?" to "In what way are an egg and a seed alike." The nonvocal section consists of (1) the echoic gesture subtest, which is composed of items which evaluate the child's ability to imitate a motor act; (2) the comprehension subtest, which consists of items in which the examiner directs the child to complete motor tasks by both vocal and gestural instructions; and (3) the intraverbal gesture subtest, which consists of questions which can be answered by either a vocal or gestural response. Some of the questions of the intraverbal gesture subtest, such as "Where is your ear?" have a high probability of eliciting gestures. Others, such as, "What do you do with a handkerchief?" are much less apt to elicit a gestural response--only gestures are scored.

The PLS has been administered to 275 institutionalized 8- to 15-year-old mental defectives. Of these 275 subjects 188 scored on the vocal section and 223 scored on the nonvocal section. Four examiners, without previous psychometric training, administered from 58 to 83 tests each. Statistical analyses indicated no differences between the score distributions of the four examiners beyond chance expectation. Odd-even reliability for the subtests ranged from .85 on the intraverbal gesture subtest to .96 on the intraverbal subtest. Correlations between the tact, echoic, intraverbal, comprehension, and echoic gesture ranged from .62 to .82. Correlations between the intraverbal gesture and the other five subtests ranged from -.02 to .32. The correlation between the vocal and nonvocal sections was .64.

Test-retest correlations on 15 subjects tested by the same examiner after 2 to 5 months and 15 subjects tested by different examiners after 2 to 5 months ranged from .64 on the echoic gesture to .99 on the intraverbal. There appeared to be no difference in the correlations as a function of whether the same examiner or a different examiner administered the test and retest.

The ITPA and the PLS are both based on learning models; however, there are considerable differences between the rationales for the two tests. The rationale for the ITPA assumes that the test items are measuring implicit processes within the person and that the language responses are merely effects of these processes. In contrast, the PLS is based on a descriptive model which assumes only that observable language responses are being sampled and evaluated in various situations.

Other attempts to develop general language test batteries have been made on a strictly empirical basis. For example, Dorothea McCarthy (1959) developed language evaluation procedures as a part of a more complete psychological evaluation battery. The language section of the battery includes five subscores: (1) Pointing to pictured objects, (2) picture naming, (3) vocabulary, (4) oral language usage, and (5) intelligibility. The first three scores are obtained from tests. The last two are based on examiner ratings of the child's speech heard during the test situation. In addition to the measures classified as language measured by McCarthy, there are also three conceptual measures which could be classified as language measures. These are controlled verbal association (how many "things to ride on" a subject can name in 20 seconds), verbal absurdities, and opposite analogies. The test has been given to 96 institutionalized mentally defective children (10 at age 6, 20 at age 8, 21 at age 12, and 24 at age 14). Testing was done by two experienced clinicians.

See p. 165-166
after references

in the records which are a function of her own linguistic system rather than that of the subject. In a transcription it is assumed that there is a point-to-point relationship between the language of the subject and the transcription system of the recorder. When one is dealing with children or mentally defective persons, this relationship is unlikely. When there is not a point-to-point relationship between subjects' language and the transcription system, parts of the subjects' language must be omitted or distorted to fit the system. Since the typists' transcription system is English transcriptions of the subjects' language, they are probably distorted in the direction of conventional English. Thus, "Gi e ga" becomes "Gi me gol" or perhaps even "Give me the doll." Finally, typing transcripts from tapes is a time consuming and expensive procedure.

In summary, I have discussed and given examples of four types of frequently used language evaluation procedures: reports of unsystematic observations, judge evaluations of language in an unstructured situation, standardized tape procedures, and measures derived from transcripts from tape recordings. While all of the procedures may have some utility, none are entirely adequate. They usually involve a rather limited and somewhat biased sample of language and an intense dependence on human instruments.

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An overall correlation of .82 was found between the weighted language and conceptual sections. Individual subscores in both the language and conceptual sections show an increase with CA and a relationship with the institutional categories of nontrainable, trainable, and educable. McCarthy did not present data concerning the correlation between the subscores of either the language or conceptual sections. It should be noted that McCarthy's last two language subscores are gross examiner judgments rather than scores based on specific items such as were discussed earlier.

Standard test procedures have been used most often in descriptive, comparative, and correlational studies. For these purposes they probably represent an advancement over measures based on the unsystematic observations of untrained examiners. Yet the language measures just described leave much to be desired.

Language has been sampled and evaluated in only a very limited number of social situations. This situation in which the language of mentally defective children has been measured has almost inevitably involved an adult in a highly contrived or controlled situation. The child's behavior in this situation may or may not be representative or predictive of behavior in other situations.

Most of the investigators have been quite concerned with the standard presentation of stimulus materials or test items. Mecham (1955) provided a procedure for presenting stimuli which eliminates inconsistency by excluding the examiner. This procedure is ideal insofar as it is completely replicable. However, it is an empirical question whether language responses obtained by the nonsocial presentation of stimuli will be predictive of the individual's language responses in a social setting. In contrast to Mecham's procedure, most investigators have attempted to assure standardized presentation of items by the selection and extensive training of examiners. However, test constructors have not been sufficiently concerned with examiner constants or biases. In most cases, after the examiners have been selected and trained, examiner equivalence has been assumed rather than evaluated. It is certainly an important consideration if comparisons are to be made on groups tested by different examiners.

Measures derived from transcriptions derived from tape-recordings are another type of procedure which has frequently been used to investigate language. While the typed transcription of tape recordings has limitations, it is perhaps the most useful procedure for analyzing and investigating spoken language in social settings. Once the transcript has been typed it may be analyzed in a variety of ways. Some of the more commonly obtained measures are number of responses, mean number of words per response, type-token ratio, verb-adjective quotient, and structural complexity of responses. In general, once the transcript has been typed, there is high agreement between counts made by different persons. The measures have yielded reliable individual differences and in some cases have shown considerable sensitivity to situational changes. Such characteristics are desirable in a language measure since investigators often are interested, not only in stable individual differences, but also in the influence of situational variables.

The typed transcription of tape recordings are, of course, not without limitations. The typist now becomes a key human instrument. The typist may introduce distortions

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Discussion following Spradlin's paper

Spradlin suggested that recorded progress made in the language development program provides the most meaningful measure of language. A detailed sequential program could include key items at each level which could be used to determine where a child should begin in the program. This approach would become even more meaningful if we were able to detail the verbal repertoire necessary for X situation, Y situation, etc. Currently it is exceedingly difficult to know where to start a particular child's speech or language program and equally puzzling to determine at what stage of development it should be discontinued. Tests are needed which allow a good definition of the readiness of the children for treatment purposes. These instruments must be specific and relevant to the treatment program.

The problem of using tests unrelated to the specific program was explored. As examples, often general language development programs have used pretest and posttest measures of articulatory change, or articulatory programs have been judged effective or ineffective as a result of psycholinguistic measures.

The heuristic effect of such new measures as the ITPA and PLS was discussed. It was felt that the difficulty of measuring treatment changes had deterred researchers from experimenting with general language development programs for the mentally retarded. The continuing study of the reliability and validity of the ITPA was commended, and it was added that the scale should be extended to assess the development of psycholinguistic abilities beyond age nine if possible. It was announced that tentative plans are to revise the instrument in approximately 1967.

The group commended Dr. Spradlin on his extensive work in originating and developing the Parsons Language Sample and encouraged him to continue expanding and extending his measure.

The discussion closed with the provocative question, "If by proper reinforcement you can get any kind of behavior you want, who would care what kind of behavior you get in a two person arrangement such as an articulatory test, intelligence test, language test, etc."

Issues for Speech and Language Training of the Mentally Retarded

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Adequate verbalization requires a capable learning mechanism necessary to master the complex, highly integrative skills of the communicative act and an altruistic environment. The mentally retarded are, for the most part, delayed in developing communication as noted when they are measured in such linguistic functionings as generalizing, associating, discriminating and manipulating verbal concepts.

Additional observations, drawn from the literature and from experience indicate also characteristics of the mentally retarded as:

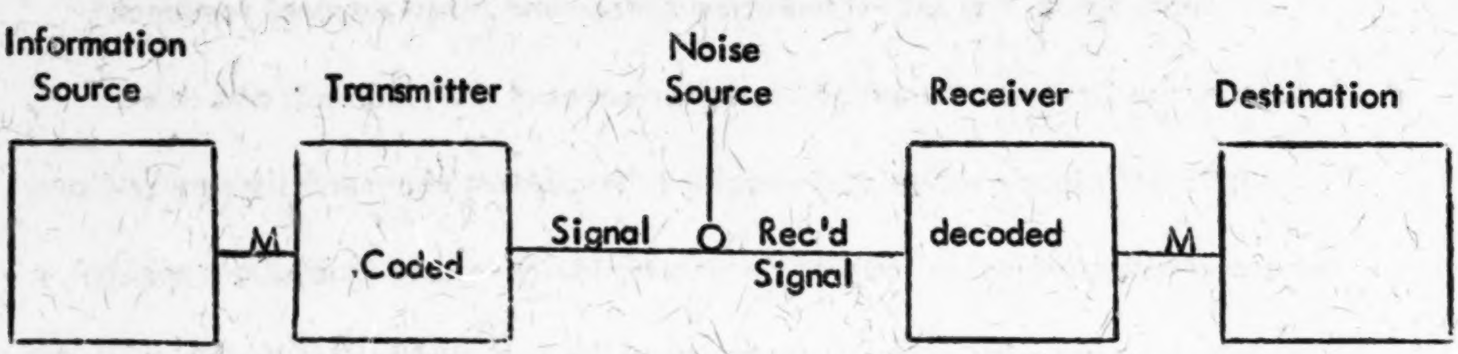
1. poor auditory retention span (auditory memory)
2. short attention span developed through negative training and/or inherent in the biological mechanism
3. linguistic ability deficient as demonstrated by poor grammar and minimal content
5. perseveration in oral expression
6. inability to transfer meanings
7. absence of self-criticism
8. poor evaluation and organization of perceptual clues
9. frustration in communication activities leading to withdrawal and lowered thresholds of frustration

Many of the above observations appear to be learned built-ins of expressive communication behavior; many are also concerned with receptive communication.

Both social and self-stimulation (inter- and intra-personal feedback) maintain the limited communication experiences of the retarded, and this linguistic deficiency serves additionally to stigmatize the mentally retarded and to strengthen a prejudical concept which typically relates inadequate speech and language use with mental retardation. The retarded are treated as a minority group subject to prejudices and discriminations by both lay and professional groups. The concept that defective communication results from mental retardation is typical of the negative attitudes of many examiners, particularly those in the speech and hearing field. We find these specialists overlooking a) the dynamic aspects of human behavior, b) the diversity of this behavior, c) and the idea that causality works in both directions, i.e. that poor learned communication habits may further depress the learning abilities and the self-evaluation of the mental retardate. In any communication training program, the attitudes of the therapist are as much in need of reorganization as are the communication habits of the subjects.

Communication is not a global acquisition nor a global development, but may be divided into parts as indicated in models such as those by Osgood for normal communication and by Wepman for the aphasic.

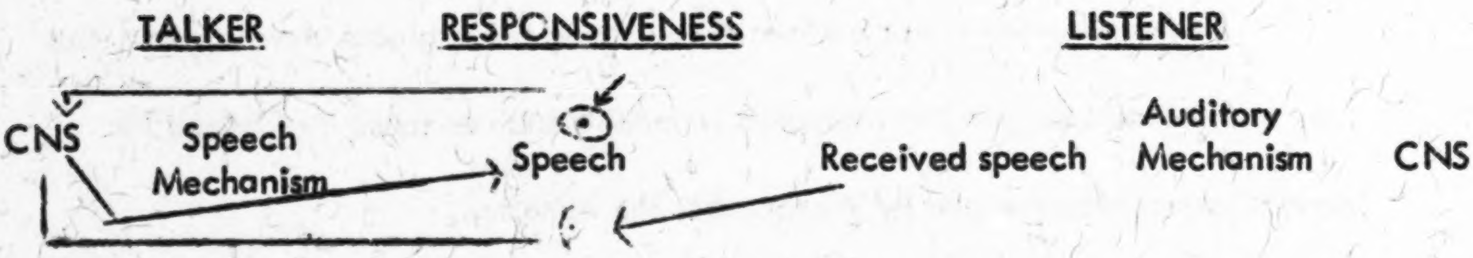
Fairbanks has offered a communication model based on engineering principles which can be used for illustrating the source of the problem. The general communication system is as follows:


Information Source
Transmitter
Noise Source
Receiver
Destination
M
.Coded
Signal
Rec'd Signal
decoded
M

* Message

The noise source is not necessarily restricted to the area indicated, but may originate in any part of the system and affect the functioning of the entire system. This is undesirable as it modifies and interferes with the entire message. An engineer can identify the source of the noise and make suitable adjustments in his apparatus for eliminating or modifying the system.

The speaker-listener Model relationship follows this arrangement in assigning production (or expression) and perception and translation of messages into meaning. This communication paradigm may be indicated as follows:


TALKER
RESPONSIVENESS
LISTENER
CNS
Speech Mechanism
Speech
Received speech
Auditory Mechanism
CNS

This analogy can be accepted if we understand that the activities are (a) reversible with the talker becoming a listener, (b) self-reflexive in that the speaker is aware of this output, and (c) capable of adjusting his message. Not only is he aware of his output through hearing, but also he receives proprioceptive feedback from himself and visual feedback from the listener. "Noise" may originate in any part of the model and in many instances is self-adjustable. Among the retarded, "noise" may occur in many parts of the model, particularly from the communicatee. The original source of the difficulty might very well be genetic and/or organic, affecting particularly the early language learning and setting limited subgoals and goals. There appears a trend, however, to be more concerned with the individual's language behavior than with neurological concepts, or labels. It is realized that the verbalization may be adjusted or maladjusted later by the environment, by its subtle and not so subtle rewards and punishments. And as the Parsons Project experiments have indicated, the environment also changes in terms of responses or lack of responses received from the communicator.

The reawareness of the model shifts the emphasis from the concentration on the production or "talker" side of the model to at least equal stress on a) the listener and b) feedback aspects of communication. Listening is used as much or more than any other aspect of communication, and certainly more attention should be focused on it. We listen to others as well as to ourselves. A speaker-listener model may emphasize specific points of departure from the norm, but one should also consider the potential maximum ability or capacity of adjustment of parts or the whole of the model. As it develops it functions at various levels of efficiency. The output may vary from nonmeaningful babbling and jargon through various gradations of meaningfulness. One way to study the listener or feedback aspects is to evaluate the "noise" interfering with the transmission or reception of the code, (diagnose). We can also seek to prognose adaptation of the mechanism to both "noise" and code estimating the potential level of meaningfulness. Any therapy model has to take into consideration this multi-dimensional aspect of communication.

The goal for each person, as it is for us, is the attainment of the maximal physical and intellectual development of which his organism is capable. We weigh the subject's abilities as well as his disabilities. In addition such variables need to be considered as (a) the therapist, his attitudes and training, (b) the setting, whether institutional, special class, or non-school age employable, (c) the authority figures in the environment, and (d) the cultural surroundings.

With these variables in mind, the therapy program might utilize such broad learning principles as described in the following outline:

1. Start at his level of language development, where he is in terms of listening and expressive behavior.

   If he does not appear to listen well (with no hearing loss noted), there should be progression from relatively unstructured activities to practices that are controlled and practical in communication. These might include such activities as:

   a. awareness of sounds through use of toy objects, records, and noise makers
   b. association of sounds with objects
   c. localization practice
   d. movement in response to sound for control
   e. sound pattern imitation
   f. discrimination practice
   g. activity to music
   h. story-telling (with maintenance of good eye-contact)

2. Use of reward as a reinforcer.

Praise, smiles, and food individually or together are given at appropriate responses. There has to be a pleasurable social atmosphere with absence of tension. This is the over-all, big scheme reinforcer.

3. Since learning is slow, and needs considerable repetition, variety within a structured program is needed.

The use of a story read, played on a phonograph, enacted by puppets, created by the subjects, drawn, colored, and placed on flannel board are a few of the motivating activities that can be used. It permits some imagination to be expressed. The lack of creative activities in programs with the mentally retarded frequently leads to perseveration of ideas and actions with the familiar word or phrase used constantly in his attempts to be ingratiating.

4. Activities should be meaningful.

Role-playing adapted to current and possible future experiences is used. In school situations various problems can be discussed and played with each student assuming different roles. Job interview techniques with placeable retarded adults is used. Real experiences can be preceded with practice in talking to teachers, policemen, postman, sales people, et al.

5. Therapy needs forward progress and action.

Programming must move from unstructured to structured, simple to less simple, from non-meaning to meaning, from the word to a phrase. Progress seen - "tokens" stars, rewards.

6. There must be some understanding by the subject of what he is expected to learn.

Because of the lack of insight in many of the mentally retarded, this is not an easy task. When working non-directively on good communication attitudes and responsiveness, the goals have to be suggestive.

7. Direct therapy on sound for the more able.

This might include, in addition, such activities as ear-training practice, muscle control and speed drills, and sound and word drills. The latter is indicated in the higher grade retarded subject if other aspects of communication besides the phonetic are adequately mastered.

Questions concerning some of the variables are posed under the following several issues:

Issue A. Does the therapist working with the retarded need special characteristics or training?

1. How may the work be made more attractive in order to hire the most skilled therapist?

2. How may a speech and hearing therapist be made more aware of the area? Does ne need special talents or sophistication in order to do therapy with the retarded?

3. Would he be a more worthwhile contributor if he could structure a communication program for special classes and institutions for large numbers instead of working with the individual child?

4. Should he search for the "noise" element in communication or concentrate on observable behavior alone and attempt to modify it?

Issue B. On what criteria should mentally retarded subjects be selected for therapy? Where and how?

1. Should the concentration be on the non-institutionalized, who constitute the bulk of the population and usually are free of demonstrable neurophysiological defects?

2. Is there an institutional effect based either on the environment or the selection of candidates for institutionalization which should be recognized in selecting?

Issue C. Preliminary Approaches to Therapy.

1. How intensively and for how long a period should therapy be planned?

2. Shall stress be placed on the phonetic or linguistic activities of communication?

3. Should therapy aim at constant evaluation (diagnostic therapy) or at prognostic therapy?

4. Is the maintenance of the status quo sufficient justification for therapy with the mentally retarded? Are the contributions of the speech pathologist to the physician sufficient justification for a period of therapy?

5. Can one model of speech and language therapy be sufficiently broad to cover all levels and types of mentally retarded subjects, or is it necessary to consider several approaches?

6. Since causes may be so many and so varied, should the therapist bypass onset of condition (differential diagnosis) and ask:

   a. How is S using communication to adjust to life situations?

   b. Does he appear not to be using his full capacity/

Issue D. What therapy procedures should be used?

1. How much emphasis on listening training?

2. What activities may be considered rewarding and have strong reinforcing properties?

3. Is a great deal of variety of activities needed in therapy with the retarded, or is boredom achieved early in repeating activities of which there is little understanding?

4. How can awareness and utilization of feedback be taught? Can the monitoring of the retarded S's voice and speech by delayed feedback motivate him to be aware constantly of his output?

5. By what associative means may word meanings be taught? Class categories, synonyms, opposites, etc.? How can the content vocabulary of many be organized into accepted language structure including function words?

6. Does a permissive or restrictive situation contribute the best learning atmosphere?

7. Can there be adequate compensation for detrimental socio-cultural factors affecting language and speech after relatively stable poor habits of communication have been attained?

8. If Special Class Curricula placed greater emphasis on oral communication which would be under the control of the therapist trained in oral activities, would this be sufficient to reach the communication attainment of many of the retarded?

9. Does group therapy offer a more stimulating milieu than individual therapy? If communication interaction is one of the goals desired, can this be achieved by selective grouping.

10. Can the parent or other authority figures carry through a therapy program, or are there too many negative reinforcements associated with them? Would direct participation in a therapy program by both the mentally retarded child and parent enable positive communication relationships to be established?

11. At what level of retardation can direct therapy be used?

Issue E. What is success in therapy with the retarded and how is it measured?

1. Which of the following could be considered immediate attainable goals and how would they be measured?

a. a communicative attitude
b. quantitative language improvement
c. qualitative
d. reduced expectation of failure
e. improved self-concept
f. insight into problem and the means of amilioration

2. How many trials or how long a period of communication interaction can be justified? Can this be assessed best by direct measures--such as word counts, developmental language scales, levels of abstraction, psycholinguistic measures, et al.?

Issue F. Are there non-traditional therapy methods that should be explored?

1. The multi-sensory approach to learning has a long and honorable history in the teaching of the retarded. Work in recent years has suggested a reduction of stimuli. Would a uni-modality approach, auditory or visual with proper reinforcement, prove better than multi-modality treatment? Which of the various avenues offers the best channel in obtaining improved responses? How can this be ascertained?

2. Imagery needs reinvestigation. In what way does the retarded individual respond to a word or picture? How can his response to an object, word, or picture be meaningfully ascertained? Would therapy along the channel of his determined image response prove efficacious?

3. Can self-administered, programmed devices using sound and picture sequences be operated by the mentally retarded to improve communication? Can the attention span be improved through machine programs? Is the machine less threatening to the retarded than a therapist?

4. Does the use of the retarded's own sounds motivate him as much as those of the therapist in various feedback operations?

5. Can the massed listening booth practices used in teaching foreign languages be adapted for use in improving the communication of the retarded? Would combining the

taped-lesson with projected slides prove to be better therapy material than either medium alone?

6. Should we use delay response training? Should we use enforced delay, with response on command? Should we use various delay periods in training?

Discussion following Schlanger's paper

Several participants spoke to the issue of the attitude of the professional worker with the retardate. The general idea that "these children can't improve much" is too often encountered. It was felt that little information or experience is brought into the speech therapists training to offset such a bias. Further research with various patterns of training for language therapists would be productive. Certainly more clinical experience with those of retarded mental development is necessary.

Schlanger reviewed the variables most important to language development apart from the subject's abilities or disabilities. He spoke of the attitudes of the therapist, the setting (whether institutional, special class, or regular class), the authority figures in the environment, and the general cultural surroundings. It was remarked that we have little evidence to demonstrate that the special class fosters optimal language development for the mentally retarded.

Further attention was given to various strategies of speech and language emphasis with the retarded. Speech therapy, speech improvement, and language development were discussed. Emphasis on more group rather than individual child programs was stressed. The size of group that can be dealt with effectively was questioned, and it was pointed out that research is necessary to demonstrate that special class teachers, language developmentalists, or speech therapists can work with the entire special class and achieve significant results.

It was felt that the special class curriculum must place further emphasis on the development of oral communication. It is hoped that such a language development program might compensate to some degree for the detrimental sociocultural factors encountered by the majority of the educable retardates entering special classes.

The group felt that a major problem remains in defining the goals of therapy or language work with the retarded. How to define success with a severely retarded child in an institutional setting is an example of the need for clarification of goals. A problem of equal magnitude is the assessment of results. The difficulty in measuring the subtle effects and short term gains of programs has kept the efficacy of such programs an area of doubt.

Language Training for Mentally Retarded Children

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In the description of the proposal for this conference we read that "there is a need to bring together into a discussion setting the potential contributions to language training which have been made by several leading theorists." It is pointed out that few studies have related conceptual language approaches to mental retardation.

Actually, to discuss any program for a homogeneous "mentally retarded" population without further qualification as to the degree of impairment, etiology, type and severity of accompanying physical, sensory, neurological, emotional or learning handicaps is of limited value. It is recognized that mental retardation is but one part of a symptom-complex of inter-related problems which require concurrent and long-term attention.

Since programs cannot be developed on an individual basis, it has been necessary to devise some method of grouping retarded individuals in terms of outstanding characteristics or needs. However, this involves classification rather than definitive diagnosis. At present, because of our dependence on traditional IQ determinations, we classify children in terms of their inability to achieve good scores on standard tests such as the WISC or Binet. We place these children in "boxes" labeled average, educable or trainable mentally retarded. Having done this, we still have little knowledge of each child's particular strengths or of the areas which most need remedy. The reports that describe on-going language programs do not clearly delineate the children being treated, thereby weakening their usefulness as models. As indicated above, only rare mention is made of the pre-school population or the value of preverbal experience in language programs for retarded children.

The majority of mentally retarded children have the potential for attaining some degree of independence and self-sufficiency on reaching adulthood. The actual level of self-sufficiency obtained depends largely on the nature of the training provided during the earliest formative years. Because it is my firm conviction that the core of this training is in language and its antecedent developmental determinants, I have chosen to look at a few studies relating to some of these determinants and then will attempt to relate the findings to a system which we have found useful in planning a language program for the young retarded child.

Research

If Piaget's (1945) observations are correct, spoken language -- the motor side of a language skill -- comes only after images, or the central processes representing objects and events, have been developed out of repeated encounters with those objects and events. The fact that chimpanzees show clearly the capacity to dissemble their own purposes even though they lack language (Hebb and Thompson 1954) lends support from phylogenetic comparisons to this notion of Piaget's. You know that O. K. Moore, of Yale, has been teaching pre-school children to read with the aid of an electric typewriter hooked up to an electronic system of storing and retrieving information. He notes that when children have learned to recognize letters by repeatedly pressing the proper keys of a typewriter they discover spontaneously that they can draw these letters with chalk on a blackboard; this lends further support to the image primacy thesis. More-over, Moore has observed that these 4 year olds, who have presumably acquired solid imagery of the letters in the course of their experience with the electric typewriter, show muscular control which corresponds to that of older children.

Of apparent importance here is the provision of opportunity for the child to encounter circumstances which will foster the development of those semi-autonomous central processes that can serve as imagery representatives of objects and events and which can become the referents for the spoken symbols.

Hebb (1949) has conceived the basis for primary learning to be chiefly on the sensory side. Piaget (1936) has conceived of looking and listening, both of which are typically viewed as sensory in-put channels as existing among the schemata ready-made at birth. Moreover, he attributes to looking and listening key importance during the first phases of the epigenetic process of intellectual development. The existence of an epigenesis of intellectual functions implies that the experimental roots of a given schema will lie in antecedent activities quite different in structure from the schema to be observed and measured (Hunt, 1961). Thus, while antecedent practice at tower-building or buttoning may be relatively unimportant for the development of skill in these activities, an unhampered antecedent opportunity to throw objects and to manipulate them in a variety of situations and an even earlier opportunity to have seen a variety of sights and to have heard a variety of sounds may be of tremendous importance in determining both the age at which tower building and buttoning will occur and the degree of skill that the child will manifest.

Early experience, particularly preverbal experience, has been considered in the past to be relatively unimportant. However, the approach to the study of the effect of early learning suggested by D. O. Hebb's theorizing about cerebral functioning has regularly yielded results emphasizing the importance of early learning. According to Hebb's (1949) theory, firing systems, which he terms "cell assemblies" and "phase sequences," must be built into the brain through what he calls "primary learning." This may be another way to say that the intrinsic regions of the cerebrum must be programmed properly by preverbal experience if the mammalian organism is later to function effectively as a problem-solver. Most of this "primary learning" Hebb (1949) assumed, moreover, to be based upon early perceptual experience. In this assumption he broke most radically with the traditional emphasis on the response side in learning. This concept led Hebb (1947) to compare the problem-solving ability in adult rats, having had their perceptual experience limited by cage-rearing, with that of rats having had their perceptual experience enriched by pet-rearing. The problem-solving ability of the cage-reared rats was inferior to that of the pet-reared rats. These exploratory results led to a series of studies in which various kinds of early perceptual experience were provided for one sample of rats and not for an otherwise comparable sample. Such studies have regularly yielded substantial effects for various kinds of early perceptual experience.

Dennis compared the effects of Hopi Indian cradling practice on the age of onset of walking with the effects of homogeneous auditory and visual stimulation on the age of onset of walking in the children in a Teheran Orphanage. The cradling practice inhibits action of an infant's legs and arms during his waking hours through most of the first years of life; yet the mean and standard deviation of the age of walking for those cradled proved to be the same as the mean and standard deviation for those Hopi children reared with free use of their legs and arms (Dennis, 1940). However, in the Teheran Orphanage described by Dennis (1960) 60% of the 2 year olds were not sitting up alone and 85% of the 4 year olds were not walking alone even though they had full use of the motor function of their legs and arms. The orphans, however, were subjected to a continuous homogeneity of auditory and visual experience. The Hopi children reared with the cradling practice did not have free use of their legs and arms, but they were exposed, by being carried around on their mother's backs, to a rich variety of auditory and visual stimulation.

It appears that having a variety of things to listen to and look at may be highly important for development during the earliest years of life, especially the first. There is certainly considerable evidence to confirm the thesis that the basis for primary learning is chiefly sensory rather than motor. This must be considered in any discussion of the developmental determinants of language skills.

Infants and young children must be exposed to experiences which promote the development of those semiautonomous central processes demanded for acquiring skill in the use of linguistic symbols and for the analysis of causal relationships.

The Russians are doing fundamental work which is of interest. Berlyne (1963), in a report on current Soviet research on intellectual processes in children, points out that,

> "There are in the world today three bodies of work on child psychology, each of about equal volume as far as empirical data and theoretical ideas are concerned. These are the literature in English, the literature in Russian, and the literature in French. The literature in French includes Piaget's work which, in sheer quantity, is about equal to all the English-language or all the Russian-language literature put together. In other words, if we confine outselves to English language literature in child psychology, we are confining ourselves to about a third of the literature of child psychology. If we further restrict ourselves to English-language literature on intellectual processes in children, we shall probably have access to considerably less than a third of the significant work."

It seemed to me that it might be useful to include a review of some of the less familiar Soviet research -- much of it is pertinent to this conference.

The two major currents in Soviet child psychology can be traced back to Pavlov and Vygotsky. Berlyne (1963) states that,

> "Toward the end of his life, Pavlov had reservations about the scope of his conditioning principles as applied to human beings."

His later writings referred to what he called the "second signal system," "the portion of the nervous system concerned with verbal behavior." The second signal system enables us to respond to words as "signals of signals."

> "Just as a light, an initially indifferent stimulus, may act as a signal for the impending appearance of food, the word light becomes a signal for the light. ...A verbal stimulus affecting the second signal system does not, in general, stand for one particular stimulus of the first signal system; it stands for a whole class of non-verbal stimuli with a certain property, or set of properties, in common. The second signal system thus makes possible high levels of abstraction."

Quite a few of Pavlov's students have been working on this second signal system, for which children are particularly appropriate subjects.

Various conditioning methods have been used to trace out semantic links and the process of generalization that follows them. The favorite method has been the "verbal method" (Ivanov-Smolenski, 1922). This method is widely used in Russia as a convenient way of inducing a conditioned response in human subjects.

Berlyne (1962) describes it thusly,

> "The apparatus consists of a device for producing stimulis such as sounds or colored lights, a rubber bulb that can be held in the subject's hand, and a kymograph or some such equipment to record the duration of the stimuli and any pressure exerted by the subject's hand on the bulb. The experimenter produces the conditioned stimulis, say a red light. Then he says the word, 'Press' (the unconditioned stimulus), and the child presses. After a few trials, a conditioned response develops: the child begins to press the bulb during the CS-US interval (i.e., when the red light alone comes on and before the E has time to say, 'Press')."

Many variations can be utilized and all of the standard Pavlovian phonemena have been demonstrated with this technique.

Once the procedure is established, technique changes (Dmitriev, 1962) so that there are four possibilities: red or green light in combination with press or no press. No new directions are given; but following the response in each case, the examiner says something. If the child presses to the red light (positive) or does not press to the green light (negative), E says, "Correct" or some such phrase. If S presses when he is not supposed to, then E says, "You shouldn't have pressed" or "You were not supposed to press." Similarly, if S fails to press within a decent interval after a red light, then E says, "You were supposed to press" or "You should have pressed." Essentially this technique involves changing from classical conditioning to reinforcement for the correct response by saying, "Correct" after the performance of the response. The latter situation seems to be more of an experiment on thinking than on conditioning. It is a test of how well the child can figure out when to press and when not to - how to figure out the rules of the game.

Marked differences have been found between older and younger children. In children of about 5 to 6 years this kind of discrimination seems to be established very quickly after only a few trials. The 3-year-olds take time to build up the discrimination. At first they respond to both lights; then very gradually the response to the negative stimulus disappears, exactly as with salivary conditioning in the dog. Reversal training takes some time and conditioning seems to be very unstable. Occasionally the younger children will miss a response just as a dog will.

4

The conclusion drawn from this is that in an older child the process is being controlled by the second signal system, whereas while in the younger child it is not. The Soviet investigators interpret the behavior of the younger child as building up typical classically conditioned responses to the lights, while he older child is using what we call "mediating responses" (Osgood, 1952). As Berlyne states,

> "He is reacting to the light with internal verbal responses that amount to self-instruction, and he is reacting to the self-instructions with a pressing response."

Parenthetically, the idea of a mediating response as the unit of thinking and intellectual functioning seems to have appeared in several different places at once.

> "Although different kinds of mediating responses and different kinds of abbreviated, fractional responses have been recognized, each of the three countries has its favorite."

In this country we stress the importance of the implicit verbal response; Piaget stresses the implicit executive responses--responses that act to modify the environment; and, although the Russians acknowledge the importance of the verbal response as a result of their interest in Pavlov's second signal system, they give major prominence to the orienting responses, which they relate to the functions of attention.

Vygotsky (1939) distinguished the role of speech in affecting the behavior of other people from its role as a means of affecting one's own behavior. When a person uses words to influence his own responses, these words need not be pronounced aloud. Vygotsky said that thought and speech are not quite the same thing, that the properties and structure of inner speech and outer speech are different. He said that thought does not grow out of speech or vice versa; but once thought and speech have appeared they interact and influence each other intimately, and speech becomes the principle vehicle of socialization. Actually, the child first allows his behavior to be directed by the speech of others, and it is much later that he uses speech to direct his own behavior as a by-product of his responsiveness to what others have said to him. Vygotsky's work led to a large body of experimentation on relations between thought and language and on ways in which both thought and language regulate overt behavior. Of those who belong to his school, Luria is probably the best known in this country because he has written articles in English and has also been on lecture tours here.

Berlyne (1963) describes significant results of some of Luria's work as follows:

> "Luria (1956, 1957, 1958b) carried the inquiry further by showing that words have a number of different ways of influencing behavior, which appear at different ages. For example, in the young child of 1 1/2 to 2 years -- about as young as one can get a child to respond to language at all -- language does not have much effect other than the production of orienting responses. If E says something to the child, he may stop whatever he is doing and look at E, or he may look at the object E names, or he may look for the object E names if it is not immediately present, but he will not do what E tells him. If E says, 'Give me the ball,' the child will just look at the ball.
>
> At a somewhat later stage, language has an impulsive or releasing function. The effect of a verbal instruction then seems to be to make the child do whatever he is ready to do. In other words, if the child is ready to give E the ball, and E says, 'Give me the doll,' he gives E the ball. This is what he was ready to do, and the language merely releases the response.

Subsequently, language acquires a selective function. E tells a child, 'Press the bulb,' and he does so here and now, showing that he can obey simple orders.

Finally, the most advanced and interesting function is that of pre-selection, the same sort of function that language presumably fulfills in self-instruction. The experimenter tells the child, 'A red light is going to come on. When there is a red light, press the bulb.' (Note that Luria has inherited Ivanov-Smolenski's apparatus, which has come into wide use for varied purposes in Russia.) The situation may be more complicated and require a discrimination. The E may say, 'Press the bulb if a red light comes on, but do not press if a green light comes on.' Again a child of about 2 1/2 years cannot do this. If E says, 'Press the bulb when the red light comes on,' then S will start pressing right away; and, in fact, when the red light comes on, he will stop because of external inhibition. A child of about 3 years will solve the simple problem, but not the discrimination. If E says, 'Press the bulb when the red light comes on,' he will wait until the light comes on before pressing; but he will also press when the green light comes on, even if E has told him not to. Finally, at about 5 1/2 or 6 years, a child can solve both parts of the discrimination. He can withhold a response, or he can perform a response where it is appropriate, in accordance with a set produced by previous instruction.

Luria also studied ways in which these deficiencies can be made up--ways in which the child can be given a crutch, as it were, to enable him to solve some of these problems at an earlier age (e.g., giving him feedback stimuli or making him give himself verbal or other response-produced cues). Luria's work shows the many-sidedness of the control that verbal processes can exert over behavior."

Soviet research on learning and perception in children emphasizes also the relation of motor movements to perception. A developmental study of eye movements and hand movements in the perception and recognition of form was carried on under the direction of Zaporozhets (Berlyne, 1963). In general, it was found that, with respect to orientation, there seems to be a strong common trend between the kinds of eye movement and the kinds of hand movement that occur. If a new stimulus is presented visually, there are wide, sweeping eye movements which seem at first to have the function of fixing the stimulus in space and then exploring around it. Finally there is a more detailed exploration by smaller movements around the contour and within the contour of the object. The same sequence is found for hand movements when an object is explored tactually.

It is interesting to note that children who were given a task of visual identification seemed to be compelled to trace out the contours with their fingers in the air. When a form was projected on a screen and they were to find its match from a group of three figures placed in front of them, very young children would spontaneously trace the projected form with their finger and could succeed at the task only if they also traced the contours of the figures before them. The interpretation was made that for young children, feedback from exploratory movements is essential in a recognition task. Also, in many of the studies on perception it has been found that training facilitates discrimination, but only when it involves motor mediation.

Zaporozhets, a student of Vygotsky, suggests that the essence of voluntary behavior is in feedback. (His book, The Development of Voluntary Movements, is soon to be published in English.) He points out that there is a difference between primitive behavior and complex voluntary behavior with respect to how much feedback occurs and at what stages, and he feels that in order to achieve the stage of voluntary behavior we must be able to receive feedback en route. He combines emphasis on orienting reactions (the objective equivalent of a conscious attentive process) and this emphasis on feedback to evolve a theory of the nature and development of voluntary action in the child. His experiments involve various motor tasks such as pushing a toy car around the correct path in a maze, knocking in a nail with a hammer, and performing gymnastic exercises. In some of the experiments, he employs children of different ages to see what they will make of the problem when they are left to their own devices. They are given some kind of reinforcement when they are correct, but they are allowed to solve the problem by trial and error. In other experiments, the child is told in advance what he is supposed to do, and then he is free to go ahead. In another set of experiments the child is allowed to learn by imitation.

Berlyne (1963) summarizes Zaporozhets work by saying,

> "the interesting finding that emerges from these numerous experiments is that verbal instruction and imitation are much more effective if they are directed toward orienting responses, as well as executive responses. In other words, in teaching a child how to carry out a complex task, one must make sure that he is also taught how to organize his orienting responses. He must learn what to look at; his attention must be directed to the right cues, both external and proprioceptive. He must make use of feedback from both the external situation and from his own actions and the experimenter must train him to do this. Several experiments show that the time to learn a task can be cut down if orienting behavior is specifically trained."

This might come under the classification of "what every good teacher knows," but it is not always put into practice.

Applications

Most descriptions of language training programs for retarded children are fairly general. However, the majority stress the need for repetition, for presentation of concrete material and the use of visual aids, the importance of "readiness" activities antecedent to speech training, sensory training, emphasis on looking and listening before speaking, training in motor skills directed toward improving coordination, etc. This approach is clearly defined by Donovan (1957) in relation to a speech program for mentally retarded children in the public schools of New York City.

At present, as Schlanger has pointed out, the usual criterion for the selection of "worthwhile" cases for therapy is the child's ability to achieve a certain educational level, as represented by the intelligence quotient. This, in spite of the generally acknowledged fact that the IQ is over-emphasized. A minimum mental age of 4 to 6 years and functioning in the educable range is often suggested as the optimal time to begin speech therapy. Yet the normal child usually begins to talk somewhere between a year and a half during the height of the period of sensory-motor learning. Why must the retarded child be put off? It appears that we might well begin to examine some applications of such theorizing mentioned earlier for the purpose of developing more fruitful language programs for mentally retarded children.

For present purposes, we have skimmed over a small bird's eye view of some of the research on language and thinking which demonstrates:

(1) the importance of early exposure to a variety of experiences in looking and listening,

(2) the importance of perceptual and preverbal experience in primary learning,

(3) the relation of motor movements to perception,

(4) the need for the development of a motor pattern as well as a perceptual pattern,

(5) the increasing importance of linguistic labels as mediating processes in learning,

(6) the importance of the orienting response as a source of internal mediators.

At this point I should like to present some techniques that we have found useful in teaching retarded children, especially with regard to language development. I will try to show the relationship of these techniques to the research findings mentioned in this paper. Possibly we can weave these into a rough fabric in which you may discern a definite pattern.

The Child Study Center, which is part of the Department of Pediatrics at the University of Oklahoma School of Medicine, is an evaluation center for children who are considered to be mentally retarded. One of our functions is an evaluation day-nursery for diagnostic therapy, where we also work with some retarded children for extended periods of time. The majority of these youngsters have little or no speech on admission, the chronological age range is from about 3 1/2 to 8 years; and the group is quite heterogeneous, particularly with respect to etiology. No child is admitted who is not functioning at a level of at least 1 1/2 to 2 years. None have major neuromotor involvement or would qualify easily as "cerebral palsy." No more than 16 children are admitted, and the most "comfortable" number is 12. The nursery directress is a speech pathologist, as well as a trained Montessori teacher, and has a good background in special education; she is assisted by 3 volunteers who have been specially trained. Students in special education and speech pathology attend the nursery as part of their respective course practicum.

Regardless of etiology or classification, most of these preschool, nonverbal children in the nursery manifest various signs of CNS dysfunction, including intellectual or developmental subnormality. Although the peripheral sense organs function adequately, sensory-motor development is obviously inadequate, the functions of attention and perception are impaired, and behavior is characterized by disorganization.

Language training must begin at the beginning. In normal development, the baby must possess a psychic life antecedent to its life of motion. Through his senses he actively absorbs images of his environment for some time even before he begins to express himself through motor activity. In order to orient himself in his world he must perceive the environment as a whole with interdependent parts. If he perceived only the separate objects and not their relationships within the whole, he would be in chaotic confusion. He must also develop an inner orientation which gives him a sense of the parts of his body, their movements and position. This inner orientation, or body-image, and the outer orientation that is concerned with relationships between the parts of the environment eventually result from looking, listening, touching and moving--all experimental roots or antecedents of language and speaking. The output will be a reflection of the way in which the organism has been able to integrate the sensory input.

In order to assist the child in his task of orientation, we provide an environment that is pleasant, simple and orderly in structure. The materials are designed to attract his attention, to "educate the senses," and to allow manipulation by the child. Our goal is to assist him in his task of creating order and sequence in sensory input by presenting a carefully constructed sequence of experience which proceeds slowly, often painfully so for the teacher, from the concrete to the abstract.

Because of the perceptual-motor disorders exhibited by the children, we emphasize training in the motor bases of behavior (Kephart, 1960) such as posture, the development of laterality and directionality, and the development of body image; training in perceptual skills such as form perception, space discrimination, stereognosis, recognition of texture, size and structure; training in auditory perception (listening), in visual perception (looking), and in kinesthetic perception (muscular memory of movements, positions and postures). (c.f. Piaget and Hebb re. image primacy and primary learning.)

Montessori (1912) materials and techniques are used in the nursery because they are eminently well-suited to the goals of training. They were originally designed for retarded children. The nursery directress is trained in the Montessori method, since the materials are of little value unless they are used correctly.

For muscular education, exercises are chosen which tend to aid the development of physiological movements, such as walking and breathing. Climbing exercises and parallel bars to swing from are used, remembering that in the earlier years the child's arms are relatively much stronger than the legs. We also include the usual games such as listening and marching to music, playing with balls, bean-bags, swings, etc.

The children especially like "Walking the Line," where they walk heel-to-toe along a line about 2 inches wide. Examples of these exercises in balance, posture, and control of movement are as follows:

1. Walking on a line -- feet in correct position
2. Walking on a line -- feet in correct position, hands by sides
3. Walking on a line -- feet in correct position, hands by sides, head erect.
4. Walking on a line -- feet in correct position, hands by sides, head erect, a flag in one hand
5. Walking on a line -- feet in correct position, carrying a tray with a solid object on it
6. Walking on a line -- feet in correct position, carrying a tray with a solid object on it
7. Walking on a line -- feet in correct position, carrying a tray with a tumbler or a glass
8. Walking on a line -- feet in correct position, carrying a tray with a tumbler or glass with water.

In order to assist development of independent function, Montessori provides Exercises of Practical Life. These utilize materials that are normally found in the child's environment and provide practice in the care of the person and care of the environment, as well as exercises in coordination.

Of importance, as the child is taught each activity, such as washing hands or polishing shoes, each step of the operation is presented, in logical, orderly sequence -- almost as one would program a computer. (c.f. Hebb on primary learning, and the Soviet stress on the conditioned response in the young child prior to the later control by the second signal system.) The child is trained to focus attention (orientation response) and to analyze each of his body movements as he repeats the sequence each time. Improvement of each step within an activity leads to a gradual decrease in clumsiness and extraneous activity.

It is fascinating to watch some of our most hyperkinetic and disorganized children begin to quiet down and to concentrate as they learn to exercise their motor drive in directed and purposeful activity. Experiences are taken in through the senses, and the child works out meaning through his activity. The children will repeat these practical exercises over and over again in a kind of perpetual motion even though they may show no progress in speed or skill. Learning requires concentration, and the only way a child can concentrate is by fixing his attention on some task he is performing with his hands. All through his development the hand is the child's teacher. We have also noted that, the more accurately an exercise can be taught in all its details, the more it seems to become a stimulus to an endless repetition of the same exercise. The child responds to the verbal instructions in what Luria calls a selective manner. After much practice, one observes the gradual transition toward what Luria calls preselection -- where the child demonstrates discrimination and a response to self-instruction. He may even be heard telling himself what to do.

When the teacher goes over each step of an exercise such as washing the hands, verbalizing each action as it is performed, the child learns what to look at; and his attention is directed to proprioceptive and external cues. He is being trained to use feedback from his own action and from the external situation (c.f. Zaporozhets.)

Examples of the Exercises of Practical Life are:

A. Exercises in Co-ordination

- I. Pouring
    - a. rice
    - b. water
    - c. milk or drink
- II. Carrying
    - a. a chair
    - b. a table
    - c. a tray with a vessel
- III. Cutting
    - a. cutting celery
    - b. cutting carrots
    - c. peeling fruit
    - d. cloth

B. Care of Person and Environment

- I. Washing
    - a. hands
    - b. table
    - c. dishes
- II. Tidying and Cleaning
    - a. putting furniture in order
    - b. dusting
    - c. sweeping
- III. Polishing
    - a. table
    - b. shoes
    - c. silver

C. Exercises in Fastening and Unfastening

- I. Dressing and Undressing
    - a. buttoning
    - b. hooks and eyes
    - c. zipper
    - d. lacing
    - e. tying
- II. Locking and Unlocking
    - a. opening and closing a door with a key
    - b. opening and closing different kinds of padlocks
    - c. opening and closing lids of boxes
    - d. opening and closing bottles
    - e. opening and closing a book and turning pages
- III. Folding and Unfolding
    - a. handkerchief
    - b. towels
    - c. clothes
    - d. hanging up clothing
    - e. paper for wrapping

The Montessori materials for "sense training" represent a selection from material used by Itard (1801) and Seguin (1864) in their attempts to educate deaf and/or mentally deficient children, from objects used as tests in experimental psychology, and from material designed by Dr. Montessori herself.

These materials are grouped according to sense: auditory, visual, tactile, baric, taste, smell, and stereognostic. They are also sub-grouped according to specific qualities--such as sound intensity, pitch, form, dimensions, color, texture, weight, taste, and odor. We will describe only a few of these materials.

Each sense is trained in isolation. There is no order of presentation according to a particular sense. However, there is an order in the psychological method of presentation. Contrasts are always presented to the child first, then identities are established through matching, and finally, gradations of quality are presented for finer discrimination.

When we "train" the senses, we are not trying to make the child see better; we are helping him to know what he sees. By providing strongly contrasted sensations followed later by a variously graded series of sensation, we teach the child to discriminate. For example, if we show him first red and then blue, then several shades of blue, we are teaching him what is red and what is blue. At the same time he is learning to compare and match, to contrast, to discriminate, to distinguish different sense impressions and to put them in some sort of order. This is the beginning of a conscious awareness of the environment as opposed to any unconscious knowledge he already may have. As he isolates the sense impressions and the qualities perceived, the child gradually builds up abstract conceptions, first the general category of "color," then redness and blueness, darkness and lightness. Of course, the retarded child does not accomplish this quickly!

Isolation of a single quality in the material helps the child to focus his attention on the stimulus, and so in many sets of exercises the objects are identical among themselves in all respects except for gradation. For instance, the color tablets are all the same size, weight and shape; but they differ in the quantity of color. In this way the child can concentrate on color alone. Since these children have difficulty in the organization of incoming stimuli, we present the sensory information in an orderly way. By training one sense at a time and by isolating one quality--such as color, or length, or height, etc., the mind can give attention to that particular quality and can learn to create mental order. The apparatus is designed to present the knowledge systematically, and so the order is apparent.

Another important facet in working with these children is to present material which allows for the activity of the child (motor mediation). The possibility of arousing the child's attention and maintaining it depends less on the quality belonging to a thing than on the opportunities which it offers to do something with it. These children are not often able to concentrate on things, but they will learn to develop a focus of attention that is sometimes remarkable in the doing of a specific activity.

Materials are available for training the auditory and visual senses, the tactile sense, the baric sense, the stereognostic sense, chromatic sense, even taste and smell. The material for training the tactile sense includes touch boards: one wooden board divided into two equal rectangles, one being perfectly smooth, polished wood, the other being covered with sandpaper; one board with alternating strips of sandpaper and bare wood; and another covered with strips of sandpaper graduated from very rough to almost smooth. There are also fabrics of different kinds, always in pairs so that they can be matched as well as contrasted.

Solid insets and blocks of wood containing holes for the insets are used for recognition of dimensions by visual and stereognostic means: in one series of cylinder blocks, the difference is in one dimension only (height); in the second series, the difference is in diameter only; in another, there is a graduated difference in all three dimensions.

There is the "Pink Tower," a series of 10 cubes, the sides beginning at 10 mm. and increasing by 10 mm. for each so that the largest is 4 in. (100 mm.). The child gradually learns to make a column, correctly graded from the largest to the smallest cube.

There are 10 rods, each 30 mm. square, but varying in length from one decimeter to one meter by regular increments of one decimeter. These are to enable the child to discriminate lengths.

For the sense of color, there are tablets in 8 colors; and for each color there are 8 corresponding shades varying in intensity. Two sets are used so that the child can match each pair until he is ready for grading the shades.

Plane insets and geometrical shapes are used for the tactile and kinesthetic exploration of form. There are also cards on which are printed the geometrical figures corresponding to the geometrical shapes so that the child can match them and interpret visually the graphic symbol for the wooden geometrical shapes.

Following a period of "sense training," after the child has had long practice in handling the materials and begins to show that he can identify differences or contrasts, the teacher begins to teach nomenclature. Here she uses the "Three Period Lesson," which was originally used by Seguin, to obtain the association between an object or quality and the corresponding name.

The First Period consists of associating the sense perception with the name. The teacher presents, for instance, the longest and the shortest rod and says "This is short" - "This is long." She repeats many times, slowly and clearly. No other words are used in order to avoid confusing the child.

The Second Period tests the child's recognition of the object corresponding to the name. After the name is given for a suitable period of time and after a few moments of silence, teacher asks, "Which is short?" - "Which one is long?" If the child points correctly, the rods are mixed and the teacher repeats the questions, continuing to strengthen and fix the association until the child is ready for something else.

The Third Period is verification that the child can recall the name corresponding to the object. Now teacher simply asks, "What is this?" "What is this?" The teacher may insist now on correct articulation, and a good bit of repetition is usually required.

The "Three Period Lesson" may be slow and tedious, but it is effective. The period of time between success in the second and in the third periods (i.e., between recognition and recall) is often quite lengthy and provides a striking illustration of the time and repetition required for a child to establish such associations, so necessary in language development.

It should be recapitulated that it is by practicing the sensory exercises first that the child gains the mental experience and concept of a particular quality (Piaget's image primacy thesis); after this, the symbol is introduced. The exercises also involve motor mediation, without which, we have learned, training does not facilitate discrimination.

The same principle is used in the education of auditory discrimination. Developmentally, a child must first learn to distinguish between noise and sound as apart from silence. Since this training starts with strongly contrasting differences and passes on to almost imperceptible differences, part of "auditory training" for our nursery children includes training in silence. This has many advantages, some of which may be obvious.

The analysis of sounds relative to speech are essentially auditory-visual-tactile-kinesthetic exercises connected with the learning of the alphabet.

Sandpaper letters are used which the child traces with his fingers as he voices the sound of the letter simultaneously, thus utilizing an integrated tactile-kinesthetic-visual-auditory approach. Later he will use the movable alphabet to build words; these are letters which the child can hold in his hand and manipulate himself. Touch is combined with movement.

The method of tactile and kinesthetic exploration of geometric forms is presented precisely as Zaporozhets describes the eye and hand movements he observed in the perception and recognition of form: fixing the stimulus in space and then exploring around and within the contour. The children in our nursery are required to trace the sandpaper letters with their fingers. First, however, they are prepared for this by previous experience with the touch boards and by tracing wooden plane geometric forms with their fingers. They have been learning to develop a conscious attentive process combined with reinforcement and the mediation of continuous feedback.

It is not possible to go through all the details of this training. However, we hope that this smattering demonstrates that many principles basic to Dr. Montessori's work are quite to the point today. Adelaide Colli-Grisoni, Professor of Child Neuro-Psychiatry, University of Milan (1957) has said it well: "Stress is laid upon (her principles) by even very recent research which... formulates problems that Maria Montessori had stated and widely discussed at a time when the assessments of Neuro-Psychology and Psycho-physiology, which now confirm them, did not yet exist!"

Several of our present-day educators in special education are presenting methods derived from Montessori, Seguin and even as far back as Comenius. However, of all of these, Montessori formulated a system of coordinated training sequences which originally were used successfully with retarded children. It is our experience that early sensory-motor training, starting at the level of pre-verbal experience, is of major importance in the establishment of a language program for these youngsters. I would suggest that the Montessori system of education is worthy of evaluation in this country.

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Discussion following Richardson's paper

Much of the discussion period following Dr. Richardson's presentation focused upon the aspect of evaluation of the Montessori system. It was remarked that those who have done the most with it have not carried on systematic research to evaluate the results. The Montessori group seems to "take for granted" the effectiveness of its system and spoke of the approach as "of major importance in the establishment of language programs", without objective comparisons with other possible methods. Dr. Richardson explained that some Montessori teachers regard control groups as morally wrong because they deprive these children of the experience given to the experimental group. Those who would systematically research the program of Montessori method find themselves without access to the materials or the accompanying manual. Dr. Richardson stated that in her opinion, the Montessori approach could be carefully researched, but that this had not been attempted in their work at the Child Study Center of the University of Oklahoma. Several members of the discussion group felt that it would be productive to develop and apply valid measures of progress of pre-school children in the Montessori and conventional nuresry school training programs. Such research should be carried out woth varied populations, i.e. varing by ability level, as well as by sensory and motoric classification.

The rationale of the approach which appeared as the most meaningful was the systematic program sensory-motor training that Montessori materials provide. Richardson felt that the early sensory-motor training provided in the Montessori techniques is very much in line with research findings and that language training programs should include these kinds of pre-verbal experiences.

Yet to be determined, however, is the relevancy of these sensory and motoric activities to the acquisition of verbal skills. A most interesting comparison could be made of Montessori and other nursery school programs in regard to the type and amount of social exchange that occurs.

Discussants also questioned the effects created by the Montessori "teacher". This method places great stress on the extent, type, and completeness of training of the "directness". Again research could answer the question of the efficacy of the method and materials in the hands of other type personnel.

It was felt that several kinds of questions need to be asked?

1. Do these materials in 1964 move the child through as sequential a program as Montessori inferred in 1912? Does a step by step sequence really exist in some exercises? In all exercises?

2. Does experience with this material transfer or generalize to anything definitive--for example, social behavior, learning skills, academic learning?

3. As one looks at the internal aspects of the program, can reinforcers be determined? Are there certain phases or points that are not reinforcing?

4. Does the child move through the program efficiently? Would learning profile comparisons demonstrate behavioral plateaus? Are there phases of the program where an error analysis would indicate revision of method, material, or steps in a process?

The Slow Learner, Grouping Patterns, and Classroom Communication

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Introduction

All research stems from a philosophical orientation or set of basic assumptions, sometimes implicit, sometimes explicit. It is my belief that as researchers we owe our readers the courtesy of searching our consciences and of making the effort to reveal our personal predilections and biases, even if such admissions may diminish popularity or easy acceptance. My own leaning is away from the deterministic stances. In fact, my orientation has been called optimistic and romantic; and, in many ways, it probably is. At least, I am interested in the large rather than the small scale goals and in holistic rather than atomistic thinking. For example, I feel that our objective in teaching children should be to encourage both independence of thought and concern for others. Such an aim may seem vague, but in a number of our research studies* we have attempted to spell out the concrete implications of such ideals as a focal point in discussions with teachers. For example, in our ongoing research** teachers read from an extensive bibliography entitled "For Competence and Compassion," which includes books which help teachers understand what Bernard Schlanger has called the "altruistic environment." In such an environment the aim is to encourage the individual to behave autonomously and to simultaneously show concern for his fellow man.

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*Drews, Elizabeth Monroe, "The Effect of Homogeneous and Heterogeneous Grouping on Superior, Average, and Slow Students." Cooperative Research Project No. 608; and, "The Effectiveness of Special Training with Audio-Visuals in Changing Aspirations of Intellectually Superior Students." Title VII, NDEA Grant No. 7-32-0410-140.1.

**This refers to the study done under Title VII, NDEA Grant No. 7-32-0410-140.1.

However, it is my assumption that this desire for children to develop in maximum ways is quite general among thoughtful adults, including those who engage in psychological research. Most of us want to foster those qualities which make us more human. There is rather general agreement among social scientists that man is above all a creature of thought -- at least potentially -- and that, if we rob him of his mind, we rob him of his humanity.

All of this does very well for objectives, but it does not provide the framework for their realization. An accelerating technology may be dehumanizing unless we take counter measures. Without appropriate education many, and particularly the slow learner, will not find useful and meaningful work nor productive leisure. There is every evidence that a contributing style of life and pattern of work are essential for psychological health. Yet social change may make this increasingly more difficult. Our technology is, not only changing the face of the earth, but also, in the name of automation, changing the conditions of work.

There will be less work, and work will be of a different character. The production of goods for consumption will be increasingly handled by machines with fewer people required to maintain and operate them, and a greater proportion of work will be associated with human services -- including many which would be difficult to envision today. Many individuals will have to learn to lead meaningful lives outside the context of tasks that were formally designated as work. Education will be needed to aid in establishing lguidelines for new kinds of work, as well as for meaningful leisure. Students must be taught appreciation of nature and art and the pleasures of primary contact with all kinds of materials. They must learn to value service to others and to see this service as respectable and important work.

As we seek to understand how human beings can have futures that are worth anticipating and lives that are rewarding, we must ask some general questions about the role education is to play. How can we develop individuals who are well-equipped to benefit from, and to contribute to, a changing society? In the light of the astoundingly rapid changes in our technology -- and still more importantly, the upheavals in our social structure -- it becomes ever more important that we seek to understand the human being and his potential for interacting meaningfully with this changing environment. We must learn more about learning itself and the development of intelligence and creativity.

In many ways it seems that students are getting brighter, that they read better, and that most of them have better vocabularies and are more voluble than they were a generation ago. This is all encouraging; however, at the same time social demands for education and training seem to be outstripping the developed capacities of much of our youth. In spite of their increased intellectual abilities, many students are finding it extremely difficult to master today's knowledge and technologies. As someone has pointed out, you have to be able to read to open a milk bottle nowadays. The point is well illustrated by the continually changing definition of an illiterate. During World War I a person was illiterate if he signed his name with an X; by World War II he was illiterate if he could not read at a fourth grade level. In a recent paper entitled "The Post-Industrial Society," the Columbia University sociologist, Daniel Bell, stated that soon we may call anyone without a high school diploma a functional illiterate;* and a still more dismal picture was painted by Norbert Weiner,** who commented recently that in the future there may be little or no work for people with IQ's below 110.

However, the view that this group is a mortgage from the past that can only retard society does not take into account the great needs of our society. The existence of unemployment does not arise from a shortage of work to be done, but rather from the inability of social agencies to shape these tasks into the parameters of work. There is certainly an increasingly wide discrepancy between the level of training required for certain tasks and the level of training of our populace. For example, the Army now suggests a minimal IQ of 115 for inductees. But the shortages of help are in almost every human service area: household help, care for the young and the aged, counseling, teaching, nursing, and social work. Much of this work needs more empathic than verbal talents, integrity, and generosity rather than speed and mental alacrity. Other needed services have not yet been been defined clearly, but need only the innovative thinking of humanitarians and the rising demands of our society. Furthermore, the need for workers in the sciences and engineering is also expanding at an exceedingly rapid rate. Thus, we have the modern paradox of widespread unemployment (a surplus of untrained labor) coexisting with a widespread shortage of labor (resulting from a scarcity of trained labor). Education's role in alleviating these problems created by the demands of a rapidly-expanding technology must be obvious -- a vastly large number of people must be increasingly well-educated and specially-trained, both to fill the demands for scientists, technicians and workers in human service areas and to avoid taking upon themselves the chronic problems of the unemployable.

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*Bell, Daniel. "The Post-Industrial Society." Mimeographed Paper developed for the Princeton Guidance Conference, January 7, 1963.

**Referred to in Gabor, Dennis, Inventing the Future, Alfred A. Knopf, 1964.

Yet we would be making a great mistake if we were to assume that the only problems presented to education by our rapidly changing society could be solved by producing an army of technicians ready to fit smoothly into the machinery of modern technology. Men still must find meaning in life. Aesthetic perceptions and non-verbal learning must be cultivated, and each of us must learn more about human living. In the world of the future positive psychological adjustment and meaningful human relations will become more and more important. The population explosion and increased mobility will cause people to live closer together, often with others of widely differing backgrounds. Thus the development of close human relationships will be more difficult by the frequent existence of large differences in background, outlook and language. Not only will it be difficult to adjust to such unusual and complex human relationships, but there will be other problems. The world that we are moving into -- a world of machines, a world of exploding knowledge, a world of expanding cities -- adds further complexity and uncertainty. The retarded may find such patterns overwhelming. They, like all of us, will have to deal with continual change and with complexities. This and the loss of old familiar ties will magnify feelings of inadequacy and aloneness if we do not intervene.

The release from the thralldom of work might produce Contented Cows (with apologies to Dr. Rosenberg) and Fat Cats, but it may also result in unhappiness. Eric Hoffer has recently noted that a sense of self-worth for most individuals in our society is dependent upon the ability to work.* Meaningful activity seems to be necessary for positive mental health. Luxury and satiety are not enough. There is a need for mental and physical involvement, for challenge and excitement. Individuals need also a positive sense of identity -- an identity which is to a large extent formed on the basis of the individual's role in society. Many feel, as complexity increases and old ties are broken, that they do not belong. Alienation and anomie have become problems of our times. The retarded and/or the lower class individual, as indicated in Hollingshead and Redlick's Social Class and Mental Illness and Haring's Attitudes Toward Exceptional Children, often feel isolated and left out.

Our psychological goal must first be to satisfy certain basic needs and then to move from this point to the development of ego strength and identity. In our teaching we want to make the learning experience one which is aiding the development of identity rather than increasing the individual's sense of alienation.

This brings me to my frame of reference -- Maslow's hierarchy of needs.** For most individuals it is necessary that the lower order needs -- for love, acceptance and recognition -- be met before they can become growth motivated and begin to work independently on intellectual tasks. The slow need and want psychological acceptance and feel that having a responsive teacher is all important. In contrast the gifted are usually treated well by teachers and accept this as a matter of course. Consequently, they are more interested in having a teacher with knowledge and ability. The gifted students prefer to work on the complex and difficult; the slow are usually happy to be masters of the obvious.***

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*Eric Hoffer, The Ordeal of Change, Harper and Row, 1963.

**Maslow, Abraham, Motivation and Personality, N.Y., Harper and Bros., 1954.

***Drews, Elizabeth Monroe, "The Effect of Homogeneous and Heterogeneous Grouping on Superior, Average, and Slow Students," Cooperative Research Project, #608. Part of the findings of this study relate to questions which were asked slow learners and superior students and which revealed these attitudes.

Perhaps all of this sounds "tender-minded" in the William James sense. However, the very direction in which society is moving is, and must be, toward more humane concern. Present emphasis on the education of the mentally retarded has come out of this kind of orientation. C. P. Snow, the British novelist, has said that at last there is a great concern for human kindness. Toynbee, the British historian, remarks that if we survive the 20th century, this era may become known as the Age of Altruism.

A survey of current research reveals little that is specifically devoted to the development of the values consonant with this frame of reference. However, there is a growing recognition among social philosophers that it is important to do just this. For a number of years it has been my view that we must re-examine and reformulate our patterns for educating youth (especially those whose talent for symbolic learning is limited) in the light of certain broader human objectives. We must ask how these slow learners can come to value themselves and others; how they can develop a desire to learn; how they can become fully participant in the dialogue of the classroom. It is my view that such beliefs and attitudes and talents are essential for effective living in the out-of-school world.

In line with these views we have engaged in research for almost a decade which has been looking at the effect of patterns of classroom grouping and teaching adaptations (in relation to differences in learning abilities) on the development of communication patterns and of attitudes toward self and school and learning.

Results

The report which follows summarizes relevant information from a large-scale study of grouping in English classes at the ninth grade level. The results of this study will be examined in terms of their implications for questions which have been raised regarding the personal development of slow learners. In particular, we wish to learn how modified homogeneous sectioning combined with a good classroom climate, favorable teacher and peer attitudes, and appropriate instruction affect slow adolescent learners in the following areas: communication patterns, self-concept, and behavior and attitude toward learning. Thus we are focusing our research effort on the question of what changes occur in the student, given a designated curriculum and a particular kind of teacher and class setting.

Research on language development supplies information that is supportive of Maslow's hierarchy of needs. McCarthy* stresses the importance of a warm, accepting environment, varied and complex experiences, and opportunities for communication. However, as Goldberg has concluded in a recent review of grouping research, little effort has been directed toward evaluating the effects of grouping on "...such changes as work study habits, social adjustment, attitudes toward learning, self concepts, and other personal-social behavior."** In other words, previous research provides little information as to precisely what effect a specially structured environment has upon the behaviors and attitudes of the slow learner.

It was with a view toward reducing the abundance of ignorance in these important areas that the study reported here was initiated. The research involved almost 600 ninth graders: 118 slow learners, 325 average students, and 150 superior students. The slow group, with which we will be particularly concerned, were three to eight years retarded in reading ability and language skills. All of them had group test intelligence scores below 90; however, when individual tests were administered, over half this group scored within the normal range. The experimental model, presented below, shows the distribution of these students in the various classrooms of the four schools. Placement in heterogeneous and homogeneous sections was made randomly from a pool of students whose abilities were roughly equivalent.

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*See Carmichael, Leonard, Manual of Child Psychology, "Language Development in Children," by Dorothea McCarthy, N.Y., John Wiley and Sons, 1954, pp. 492-630.

**Miriam Goldberg and others, "The Effects of Ability Grouping: A Comparative Study of Broad, Medium, and Narrow Range Classes in the Elementary School," Teachers College, Columbia University, 1962. p. 116. Mimeographed first draft.

Experimental Model

Class and Group	Schools and Teachers							
	Otto		Pattengill		West		Walter French	
	A Exp.	B Inexp.	C Exp.	D Inexp.	E Exp.	F Inexp.	G Exp.	H Inexp.
Homogeneous Superior 10-14*		X	X			X	X	
Homogeneous Average 7-10*	X	X		X	X		X	X
Homogeneous Slow 2-6*	X			X	X			X
Heterogeneous 2-14*	X	X	X	X	X	X	X	X

*Reading and Language Grade Levels

Abbreviations:

Exp. = "experienced" teachers, one

Inexp. =

X = a ninth grade class in English.

The teachers were trained in English, and more than half of them had Master's degrees. Special in-service training sessions were held on a bi-weekly basis to allow this group an opportunity to engage in free discussion and form a philosophical orientation.

There is evidence that many teachers do not typically have discussions in their classrooms, although ostensibly English teachers have as a basic concern the use and interpretation of language. Typical class activities emphasize reading and writing skills and may include oral work; but this is often recitation, not the verbal interplay of free discussion. Our belief was that the latter form of oral communication was particularly desirable and that leading or participating skillfully in discussions was a talent which could be modified and improved. Traditionally, teachers spend more time talking than listening to their students; however, we concluded that this was not desirable* and that students should more often be encouraged to formulate their own ideas and attempt to express them. We wanted to avoid such teacher statements as "I taught him, but he didn't learn."

Although the teachers had been trained in English rather than in psychology, during these in-service training sessions they showed considerable concern for the psychological health of the students. Discussion often centered on ways to improve the psychological climate of the classroom so as to maximize the emotional growth and well-being of the student. In addition, discussion often was concerned with the use of special methods and materials with slow learners. Many curriculum adaptations were made, and materials such as Teenage Tales, Hot Rod Magazine, and Popular Mechanics were used extensively.

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* Both Berrill and Bruner have written extensively on the need for involvement if learning is to be effective.

Berrill, N. J. Man's Emerging Mind, N. Y., Dodd, Mead, and Co., Inc., 1955.

Bruner, Jerome S. On Knowing, Cambridge, Belknap Press of Harvard University Press, 1962.

We not only wished to insure that the teachers had an understanding of the psychological and intellectual needs of their students, we also wished to discover how this understanding would affect their interaction with students. Research designs, especially those formulated to test the effectiveness of grouping, rarely specify the content and method of teaching and seldom call for objective records of this process. To improve this situation we, not only discussed teaching approaches and materials in out-of-class meetings, but also followed the teacher into the classroom with trained observers and tape-recorders so that a record could be made of discussions.

We were also eager to have a comprehensive description of the students. Who were these slow learners? We knew that, although they read very poorly, they were faced with a curriculum where perhaps 85 per cent of their activities required reading skills. We also knew that 70 per cent of the slow group had fathers who fell into the unskilled categories on the Warner scale.* We also discovered that, more often than not, slow students were middle-born children in contrast to superior students who were more frequently first and only children.

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* By way of contrast, on the same index 80 per cent of the superior students were rated above this level.

Relative to their other communication abilities, slow learners seemed to be best at talking while their retardation was greatest in written composition and spelling skills. Their reading ability was somewhat better than their writing skill, but both reading and writing were well below their oral language development. Thus class discussion seemed to be a particularly appropriate mode by which the slow could learn and could experience successful and meaningful participation in school.

In view of the paucity of previous research in the area of classroom communication processes, the methods developed in our study were of necessity largely exploratory and informal in nature. Data were collected by teams of three observers* who visited each of the twenty-two classrooms three times toward the end of the experimental year. At each of these three sessions, both teachers and students completed evaluation sheets on the discussion. The teachers rated the quality of participation of each student, and the students indicated how they felt about what was said. Observers kept a record of classroom climate and attempted to categorize classroom contributions. They also kept a record of order of student and teacher speech so that typescripts made from tape recordings (two of the three observed discussions were taped) could include the names of student contributors.

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* Observers were graduate and honors students at Michigan State University who Spent the term prior to the experiment studying approaches.

Detailed analysis of typescripts of all classes of one session yielded rather striking results. The mean number of contributions** per class made by 63 slow students in homogeneous classes was 4.03, as compared with .86 for 36 slow students in heterogeneous classes. Thus a major difference found between the responses of slow students in the homogeneous and those of an equally retarded group in heterogeneous classes was in the pattern of participation. In homogeneous classes, the usually silent slow student became a frequent discussant, and there were a far greater number of all class members who participated than there were in the heterogeneous classes where discussions were dominated by the intellectually superior students and a few voluble average students.

Oral participation in classroom discussion seems to be related to a kind of social reinforcement. At least this study revealed that students who talked were chosen by their peers as more competent than students who did not talk and that this was true whether the student was slow, average, or superior and whether the group was homogeneous or heterogeneous. However, a matter just as important as the fostering of social skills is the strengthening of learning. Oral interplay appears to accomplish this also. Putting an idea into one's own words and stating it clearly so that one's classmates can understand it demands much more involvement and a different kind of cognitive process from the usual classroom situation. Such involvement encourages a greater mastery of material -- gained by the necessity of having to understand it well enough to put it into one's own words and by the additional bonus to memory (both storage and retrieval of information) when the

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** A contribution is defined as an uninterrupted verbal communication by a student or teacher.

material is translated by each individual into his own idiom. Oral participation can be encouraged by the structuring of setting and the providing of a facilitating climate.

This participation would seem to facilitate both useful learning and a more positive concept of self. Part of these benefits to the student may accrue as a result of the adaptability of the teacher and her ability to provide an appropriate communication model. In the study reported, the teacher participation differed both in quantity and in level of difficulty for students of different ability levels and ability groupings. For example, the typical teacher in this study used easier words, shorter sentences, and participated more frequently and a greater proportion of the time when she was working with a homogeneous slow group than when she was working with a homogeneous superior group. An analysis of the percentage of words above the fourth grade level used by the teacher in different classes showed that in slow homogeneous classes, teachers tended to modify their vocabularies toward the level of student, using only 7.6 per cent of higher-level words as compared with 12.6 per cent in the heterogeneous classes and 15.0 per cent in the homogeneous superior classes. The flexibility in teacher leadership and communication patterns was not the direct result of any prior set of instructions given to teachers involved in the experiment, but seemed to reflect a sensitivity to the needs of the particular students being taught. In the homogeneous classes the teacher was able to respond to the particular needs of the group to a far greater extent than was possible in heterogeneous classes, where this could not be done without shortchanging some groups of students.

A further finding of particular relevance to the problem of the slow learner which emerged from our grouping study concerns the effect of grouping on peer attitudes toward the student. The differences with which the slow learner is viewed in the homogeneous and heterogeneous classroom is also apparent when we consider the teacher's ratings of him. Toward the end of the experimental year, teachers were asked to rate students relative to the entire ninth grade population. The dimensions on which students were to be evaluated included: questioning attitude, open-mindness, creativity, use of research evidence other than text, quantity of participation, quality of participation, and social acceptability. In addition, on three separate occasions during the second semester of the experimental year, teachers were requested to evaluate the student in terms of that day's performance. At the end of the year, students were asked to make sociometric choices in social and intellectual settings. With respect to slow students, differences between homogeneous and heterogeneous classes were striking. In heterogeneous classes, only 3.7 per cent of the slow students received five or more intellectual nominations from their peers, as compared with 71.8 per cent of the slow students in the homogeneous classes. In social nominations, only 33.3 per cent of the slow students received five or more nominations in heterogeneous classes, as compared with 61.5 per cent of the slow students in homogeneous classes. Admittedly the results are in part artificial, since in homogeneous slow classes only nominations of other slow students can be made. Nevertheless, the findings underline the fact that in a homogeneous class an experimentally-imposed social structure* may have a profound effect on the individual. In heterogeneous classes the slow student is rarely nominated by his peers for social or intellectual choices. Partly because his peers disregard him, he begins to devaluate himself. In a homogeneous class both he and his peers are presented with a new reference group, and he finds himself both evaluating himself and being evaluated by others by new standards -- ones which more closely approximate his own abilities and potentialities. Furthermore, relatively more of the total group is brought into active discussion relationship and leadership roles and thus more students develop a sense of involvement and a feeling of belonging.

In ratings of intellectual adequacy (on a five-point scale) made by teachers, the mean rating for slow students in homogeneous classes was 2.7, and in heterogeneous classes 1.7. In social ratings, slow students were rated at 2.9 in homogeneous as against 2.1 in heterogeneous classes. It should be kept in mind here that these ratings are made with respect to the total ninth grade population, and yet slow students are consistently rated higher by their teachers in homogeneous classes than in heterogeneous classes. These results reflect a complex interaction of factors. First and most obviously, students are seen in relation to a new set of standards -- they are more likely to be evaluated in terms of their own abilities in the homogeneous classes. But in addition, higher teacher ratings may reflect the more adequate performance of slow students. They read more, talk more, and in general perform in relatively superior ways in homogeneous classes.

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* Just as the good hostess invites those individuals to a party who will probably find one another compatible and where she believes meaningful interaction will occur.

Differences in evaluations of the slow student in homogeneous groups extend also to the student's evaluation of himself. Students were asked to compare their ability with that of their classmates. On a three-point scale, homogeneous slow students rated themselves as 2.24 (slightly above average) whereas heterogeneous slow students rated themselves at 1.71. This difference was significant at the .001 level. In addition, a Concept-of-Self-as-School-Learner scale consisting of twenty items with a four-place response scale was administered with similar results: homogeneous slow students rated themselves significantly higher than did heterogeneous slow students. The homogeneous slow students received a mean score of 10.9 in contrast to the heterogeneous slow students who received a score of 5.5 This difference was significant at the .05 level. Again, there are probably many factors which produced this difference. In the homogeneous class, increased peer acceptance, a more favorable and accepting attitude on the part of the teacher and most probably an awarness on the part of the student himself of his increased productivity all contribute toward a significant change in his self-concept.

I have tried to describe the four broad areas with which our investigation of grouping was concerned in terms of their particular relevance to the problem of the slow learner.. Perhaps at this point it would be well to attempt a summary of the results in terms of the complex interrelatedness of these different aspects of the study. We noted first of all that communication patterns in the homogeneous classes differed from those in heterogeneous groupings. The teacher was able to direct her full attention on the slow learner and his particular needs and was able to exhibit some flexibility in her own speech patterns. We mentioned earlier that the slow learner evidences a strong need for acceptance from the teacher. He apparently should have his lower-order needs (for security, acceptance, recognition) met before he can proceed to higher-order cognitive needs and more self-direction and risk-taking.* In terms of communication, this means that before the slow student can feel free enough to express himself, he must feel safe in doing so; before he can talk, he must know that someone is listening. In the homogeneous classroom, the teacher is free to do just that -- provide the assurance he needs, and as he begins to express himself, to encourage him to assume some of the leadership in the discussion process. In addition, the teacher must be able to communicate with him on his own terms and his own language.

We have seen what happens when such a warm and accepting environment is provided for the slow learner. He becomes more open to himself and to the world; he participates much more in discussion and begins to formulate his own ideas -- or to phrase the ideas of others in his own terms; he reads more; he writes more; he becomes much more involved in the classroom learning process. In addition, the homogeneous structure of the class of which he is a member makes it far easier to win peer group acceptance. He is not one of a group of students similar to himself in background, interests, language and capabilities--a group with which he can identify himself as an active and significant member readily and with which he can communicate with relative ease. As he gains increased group acceptance and teacher acceptance and as he finds himself beginning to contribute much more actively in the classroom communication process, his sense of self-worth and competence increases. This in turn frees him more and more to establish lines of communication between himself and the outside world of people and ideas; in short, he becomes free to learn. This is the pattern which emerges from the various aspects of the grouping study.

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* This hierarchial relationship of lower-order and higher-order needs is not always the case -- they can proceed together, but it does seem to be generally true with the slow learner.

Research Considerations

In a recent book, Vygotsky* states that "the primary function of speech is communication, social intercourse." This statement indicates that the study of speech should properly be conceptualized within a broad framework which includes all forms of social intercourse. The viewpoint expressed in this paper implies that communication problems in the slow learner must be approached from the standpoint of broader problems in interpersonal relations. As to the question, "Why study communication in the classroom?" I think that a full and thoughtful answer can only be given when it is realized that the process of education is really nothing other than communication; in a very real sense everything we know which does not result from direct "blind" sensory experience to which we have not yet assigned any meaning results from communication. The classroom is in many respects an ideal place in which to study verbal interchange as it relates to thought process. It provides a natural setting for interpersonal exchange, that is, it is not artificial or contrived in the way that a laboratory may be; and yet it is amenable to certain kinds of control. Second, it lends itself readily to two different types of research. Research in the classroom may be directed at identifying and analyzing the nature of the communication process and communication problems (studying the situation as it is), or it may be directed at attempting to identify factors which will remedy the problems (intervening and providing for more adequate learning).

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* L. S. Vygotsky. Thought and Language, M. I. T. Press, 1962, p. 6.

Many factors have been associated with the retarded development of language ability. In addition to congenital and other defects of the speech organs, impairment of speech and hearing may result from impairment of the functioning of the central nervous system as a result of brain damage (as in aphasia). Perhaps more common are the children who are isolated or neglected, culturally deprived, or who fail to develop language ability as a result of lack of opportunity. Whatever the cause of the deficit, there seems little doubt that the encouragement and facilitation of the use of language is an important educational endeavor.

The importance of attempting to remedy language problems as early as possible may be seen when one considers how closely related are language and thought. Whorf* has pointed out how language shapes the very nature of our thoughts. This close relationship between language and thought is particularly evident in the schools, where learning ceases if for any one of a number of possible reasons communication channels are cut off. Further evidence lies in the fact that individuals learn best and most thoroughly that which they are able to express in their own words. Processing information in one's own terms increases ability to retrieve it later and makes it easier to relate newly-acquired knowledge to previous knowledge and experience so that it is assimilated in a form in which the individual is most likely to be able to make sense out of it, both in terms of his needs and in terms of his other knowledge. In this light it is easy to see how a communication problem actually does impair an individual's ability to learn, and not merely his ability to express what he has learned.

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* B. L. Whorf, in Maccoby, Newcomb and Hartley, Readings in Social Psychology.

Communication, as we have stated, is intimately related to other areas of interpersonal relations. Communication behaviors can for this reason play a very prominent role in social acceptance. It is in general true that those with an ability to convey feelings and ideas through language are more socially accepted than those who cannot interact in these ways. Any human relationship can be improved by the proper use of speech as communication. The central role of speech in friendships is easily grasped if one tries to imagine a close friendship in which the two parties could not talk with each other. It is for this reason that it has been said that the measure of a good marriage is the amount of conversation between the partners.*

It is largely because of the many-faceted importance of speech that it can provide a wedge for breaking into the vicious cycle which is set up for the slow learner. Security and confidence can begin to replace the fear and anxiety which already is present in the slow learner; doors can be opened to further communication; and a solid positive groundwork for further development can be laid.

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* Robert O. Blood, Jr. and Donald M. Wolfe. Husbands and Wives, Glencoe, Free Press, 1960.

Further research could be aimed profitably at both a wider and a deeper understanding of problems involved in communication for the slow learner. There should be efforts to understand the interaction of many variables in the communication complex. We should not lose sight of the broad framework within which specific events and processes occur in our attempts to gain more specific information as to their nature.

One question of great practical importance which needs answering is: what is the optimum range of achievement and ability differences in the classroom, both from the teacher's and from the student's viewpoint? Restated from the standpoint of communication this would ask at what point do differences become so great that communication channels are closed?

A great deal of general knowledge is needed about thought processes and communication patterns for all adolescents. Our knowledge in this area is unfortunately both limited and vague. In particular, we need to know the characteristics of the thought processes and language patterns of the slow learner: How and why are they different (if at all) from those of the average adolescent, and what significance does an understanding of these differences have for methods of helping the slow learner? What are the relative strengths and weaknesses in communication patterns in slow learners, and how can strengths be emphasized in such a way that weaker areas are favorably affected as well?*

More information is needed about the specific ways in which communication is related to personality variables and interpersonal variables. Particularly useful would be a greater understanding of the process of identity formation in the adolescent and of the role the self-concept plays in the degree of task-fulfillment or ego-satisfaction which the individual derives from school learning. In what ways is the self'concept's development impaired in the slow learner?

Very little is known about the various stages of cognitive functioning in adolescence. A related question of fundamental importance is whether cognitive development in the slow learner is merely arrested or somehow distorted as well so that development proceeds in a somewhat different direction from that of the average or superior student. May we conceive of the slow learner and the rapid learner as having reached two different stages on the same continuum, or are they on different continuums altogether?

What role does the nature of instructional materials used in the classroom have in facilitating or impeding the development of the slow learner? How may the teacher best facilitate the development of language skills and concomitant emotional and cognitive development? To what extent should the teacher adapt to the language patterns of the slow student in attempting to communicate with him?

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* Maslow indicates that "The syndrome of self-esteem, for instance, has been shown to change as a whole. If we try to change Johnny's stammering and address ourselves specifically to this and this only, the chances are very great that we shall find either (1) that we have changed nothing at all, or else (2) that we have changed not Johnny's stammering alone, but rather Johnny's self-esteem in general, or even Johnny as a whole individual. External influences usually tend to change the whole human being, not just a bit or part or him." (Abraham Maslow, Motivation and Personality, N. Y., Harper Brothers, 1954, p. 29).

What are the potentialities of the slow student for learning; what goals may we realistically set ourselves in attempting to encourage his development as fully as possible? What impact does the answer to this question have on the curriculum currently being offered to the slow student?

Finally, what methods are available to us in attempting to formulate research answers to some of these questions? Which methods are likely to prove most fruitful? It seems to me that, as in all largely exploratory research of this kind, a fundamental error to be avoided at all costs is that of entering into research with a preconceived theoretical orientation which can determine to some extent the nature of the data collected (e.g., type of classifications and categories used, etc.). Theory should be built on facts, not the other way around.

Second, in an area of research touching on so many specializations and so many other disciplines, it is perhaps most advantageous to try to take into account as many relevant kinds of variables as possible, attempting to relate them in a flexible and interactive framework. In addition, specialized knowledge from other fields is frequently quite useful in gaining understanding and may be incorporated into a larger framework.

A further research method which deserves more refinement and application is that of content or interactional analyses of communication processes. Such an approach would prove invaluable in learning more about such problems as the nature of different verbal statements in the classroom. Levels of thought process, value systems, and efforts to listen and integrate might all be distinguished. As verbal behaviors and their antecedents are identified, it would be possible to introduce new materials and new teaching approaches. Research on communication among slow learners would thus provide an ever-increasing fund of knowledge about a vitally important behavior as it responds to social and educational inventions that would produce desirable change.

Discussion following Drews's paper

The group generally commended Dr. Drews for her approach to the study of classroom behavior. One participant asked what her present studies in this area are revealing. Drews explained that her current work has become more related to studies of creativity with primarily emphasis upon gifted children. One facet of her current work relates to the influences of discussion upon the critical thinking scores of gifted children.

Drews has conducted other grouping studies with low achieving and superior students. It was generally agreed that grouping poses a vital question for educators who seek to develop special environments, special approaches, special curriculua, and special programs for children.

Agreement was also reached regarding the need to study the critical variables related to selecting children for special groups. The group process as a facilitating arrangement for enhancing discussion, communication skills, social reward, and stimulus control features were discussed as possible fruitful areas for further study. Drews expressed her own predilection for studies to determine the facilitative effects of a combination of special grouping combined with special instructional methods.

Data presented by Drews showing the altered behavior of both the slow learners and the superior children in special groupings and the relatively unchanged behavior of the normal children in the special groupings were noted. If special effects can be created for the children at each end of the ability continum, then we must experiment further to develop the most productive learning environments for them. Such circumstances very likely may not be best facilitated within the heterogeneous class groupings.

Report Prepared by the Sub-Committee on Theory

Committee Members: John B. Carroll
Jack L. Michael
Seymour Rosenberg, Chairman
Joseph Spradlin

Initial discussions by the committee members were concerned with the question of what uniquely distinguishes research on the theory of mental retardation from other research activities in the area of mental retardation. Two answers evolved from the discussion.

One answer was that research on the theory of mental retardation might mean research on the etiology of mental retardation. We dismissed this tack for obvious reasons.

A second answer was that research on theory could be reinterpreted to mean the application of a general theory or body of knowledge (e.g., linguistics, behavior theory, social psychological theory) to research in mental retardation. The notion is that the planning, design, and analysis of research in almost any area of mental retardation might be improved by the application of knowledge from these other areas. The Committee pursued this interpretation of their task although it meant overlapping with the functions of the other three committees.

In effect, the Theory Committee discussed research related to treatment, development, and measurement areas of concern to the other committees, Perhaps the only differences between the report of the Theory Committee and those of the other committees are the special biases and interests represented by members of the Theory Committee.

Before getting into the subject matter, one more comment should be made about the operation of the Committee. After the first meeting of the Committee, it appeared inconceivable that we could get unanimity on a single group report in so short a time. Instead, it was suggested that the group report consist of a collection of "minority reports," each of which would cover a person's own interests and special areas of competency. The Committee met several times and functioned as a critical audience for each of the minority reports. Three reports follow, the first by John Carroll on Linguistics, the second by Jack Michael on Behavior Engineering, and the third by Seymour Rosenberg and Joe Spradlin on Social Interaction.

Linguistics - J. B. Carroll

Introduction: Any program of research on mental retardation, whether it involves simply the description, measurement, and diagnosis of this disorder or whether it involves instead treatment, therapy and follow-up, needs to be based upon clear and well-defined systems for identifying the receptive and productive communication behaviors which are found in mental retardates or which one seeks to teach them. A description of the communicative behavior of the retardate and of the responses one might desire to teach him can profitably be based upon a description of the language or dialect of the speech community.

Linguistic science is the discipline which is centrally concerned with the description and analysis of languages and dialects; and, even though educators and others have developed systems of language analysis, it is probably wisest to rely on the most scientific systems of description that are available. Convenient references describing linguistics and methods of linguistic analysis are those of Carroll (1953) and Gleason (1961). A useful reference on the linguistics of American English is the text by Francis (1958).

Language is ordinarily defined as "an arbitrary system of vocal symbols used by a speech community in social communication," or words to that effect. This definition draws attention to the fact that language is a system or code that underlies its actual use in communication. We can use terms such as "speech" and "listening" to refer to the actual use of language in communication, that is to the behavior of speakers and hearers which is patterned on a particular language system. This definition excludes gestures and a wide variety of noncommunicative acts from the strict definition of language; but there will be no objection to speaking of gesture language, pantomimic language, etc. to refer to these paralinguistic communicative systems.

Linguistic science provides a model for analyzing speech and listening behavior in that it not only identifies the linguistic entities that constitute the conventionalized stimuli and response underlying that behavior, but also specifies this structural relationship.

Major theoretical problems for research: Two classes of questions are posed, one dealing with language development and the second with the general learning abilities of mental retardates.

1. To what extent does the course of language development in mental retardation resemble that of normal children? Is it the case that the stages and sequences of development are the same except for a much slower rate of development in mental retardates? Does the resemblance reside only in the grosser phases of development (e.g. the presence of babbling, the stage of early word acquisition, followed by the stage of syntactical development) or does it exhibit itself also in the detailed sequences of development as they might be found by an analysis of the order in which syntactical features are acquired?
2. For any given recognized clinical grouping of mental retardates, what are the parameters of learning and retention? In what way do these parameters differ from those obtained on "normal" populations? Of theoretical interest here, of course, is the question of whether the limits of learning for mental retardates are fixed at markedly lower levels than for normals, or whether the differences are primarily with respect to rate of learning. Also to be investigated is the

question of whether or not slow learning results because of inadequate prior learning of basic repertoire of prerequisite skills, learning sets, etc.

Linguistics and mental retardation: For the mental retardate, language learning seems to be in some way more difficult than for the normal person. To what extent is this a function of linguistic structure? For example, would a more regular language structure (Esperanto) be easier? Or in the case of learning to read, does the complexity of English orthography present more difficulties than would a simpler system like Augmented Roman (Pitman)? Though it would probably not be practical to teach Esperanto, the teaching of Augmented Roman or some other simplified spelling system might be explored.

In order to expedite the teaching of language, some techniques of foreign language teaching as developed by linguists might be utilized. Among the procedures which might be relevant here would be 1) teaching simple kernel sentence types before transformations of them and 2) controlling the order in which transformations are applied (for example, teaching yes-no question types before wh-questions, teaching positive sentences before negative sentences, teaching active voice sentences before passives).

A second set of procedures from foreign language teaching is the following. Large amounts of substitution drill should be given so that form-class habits will be strengthened. For example, the teaching of a simple kernel sentence like noun-intransitive verb should be arranged so that the child learns to replace the noun with other nouns, as in "Johnny walks," "the man walks," "the dog walks," etc. Another example is the placement of the verb with other verbs, like "Johnny talks," "Johnny walks," "Johnny eats," "Johnny walks." Actually, the choice of this example may be bad, since a preferable structure would be the present progressive: "Johnny is walking," "the man is talking." The simple present is best presented with the adverbial modifier, like "every day," "every morning," etc., so that we have: "Johnny walks every day," "the man walks every day."

A third set of procedures from the teaching of foreign languages which can be applied to the case of retarded language is the maintenance of the referential functions of language as strongly as possible by insisting that new language elements be generally learned under appropriate stimulus controls. That is, new words, new morphological variants, new syntactical patterns, and so on must be introduced in such a way that their referents (the concrete objects, perceived relationships, situational conditions, etc.) are introduced in appropriate contingent relationships. For this purpose, much use must be made of pictures, props, and pantomime in language teaching. This does not preclude, however, drill on sentences and other structures without immediate referential control for the learning of intraverbal associations that are only indirectly related to referential situations. For example, a phrase like "big bad wolf" might be learned first as a series of associated words before the referential functions of those words are learned. It should be noted that further psycholinguistic analysis may be required in order to specify the appropriate stimulus controls for various syntactical patterns. What, for example, is the proper behavioral setting for declarative sentences? Do they occur chiefly in response to questions?

Linguistic and conceptual requirements of the mental retardate: In developing language training procedures for mental retardates, there is a need for information concerning the linguistic and conceptual requirements of the situations in which the mental retardate is to operate. This presupposes two kinds of analyses. One is specification and classification of life situations in which the mental retardate is to operate such as, the school, the place of work, and the social environment. The second is the analysis of linguistic and conceptual requirements of the above situations. That is, what is the minimal vocabulary for each situation? Will gestural communication be sufficient? How well will it be understood by the normal person who is interacting with the retardate?

Some explanation of what we mean by "conceptual requirements" may be in order. It is possible to give an account of language behavior which regards linguistic entities (words, morphological changes, syntactical patterns) as representing concepts in the sense that each entity is a response to a class of stimulus situations with definable attributes. For example, water (as a linguistic form) is a concept that refers to a large number of possible situations in which that sort of liquid is present. A more subtle concept is represented by the conjunction if. If, as a matter of fact, is a translation into linguistic terms certain behavioral paradigms that can be treated psychologically under the rubric of conditioning. For example, the sentence "If he comes, call me." programs into the listener a contingency of calling behavior dependent upon a certain event (his coming). It would be of interest to study how rapidly a mental retardate can learn the proper use of if either as a listener or as a speaker. This sort of investigation could be extended to a wide range of concepts.

Behavior Engineering - J. L. Michael

In industry, a distinction is sometimes made between basic research and developmental research. Basic research is an attempt to find generalizable facts and principles, to evaluate hypotheses of theoretical significance, to answer abstract questions, and so on. Developmental research is often little more than a euphemism for trying to use existing knowledge to develop a product that has certain specified features. It is this latter kind of activity which seems most important at the present time.

The last 20 years of behavioral research has resulted in the discovery of a number of techniques for the control of behavior. These techniques and the principles underlying them are stated in terms of manipulable independent variables and observable dependent variables, which makes it possible for anyone who can read to apply this knowledge. Although there have been many successes in changing some behavior in some retarded individuals, there has as yet been no intensive and systematic exploitation of this technology for the remediation of retarded behavior in all of its aspects. It may be that the answers to most of the researchable questions which can be posed at the present time will be of little interest when we see that we can produce dramatic changes in behavior by more effective training. For example, comparison of the behavior of retardates with that of normals, say with respect to syntax complexity or modes of dyadic interaction, seems almost beside the point when we can produce various kinds of syntactic or interpersonal behavior by training. What such studies show is the result of the interaction of an unknown and chaotic environmental history with an uninterpretable, or often non-existant organic disability. And to make them even less relevant, the results are usually couched in terms of group averages or other statistical concepts whose application to the individual organism is quite unclear.

The kind of research which seems most relevant to our present situation is illustrated by the work of Dr. Sylvia Richardson on the application of the Montessori method to the training of young retardates and by some of the work of Schiefelbusch, Copeland, Spradlin, and others at Parsons in altering the verbal behavior of the retardate. If, as may well turn out to be the case, intensive training of the Montessori kind renders the language of retardates considerably more effective than ordinary training, who is going to be much interested in the characteristics of those who do not receive such training?

On the other hand, many people have worked for a long time in the field of retardation, and most express a relatively pessimistic view about such changes in behavior. The stability of the condition of mental retardation is often cited as evidence for an underlying deficiency in the learning ability trait. How can the optimism implied above be maintained in the face of such a recalcitrant subject matter? Perhaps the answer is an unflattering one in terms of the learning ability of the optimists, but there is another possible answer.

There is a common tendency to overestimate the extent to which human learning is related to the ordinary deliberate instructional activities of other humans. A very large proportion of a child's repertory is developed as a result of the inadvertent consequences of his behavior on the physical and social environment and of the effects of these consequences on his behavior. This means that most human teaching activities represent only the final step in the development of a complex repertory. For example, when a parent teaches a child to tie his shoe, he is working with an organism that already has learned a large class of behavior regarding verbal instruction and imitation, as well as one that has learned to be reinforced by subtle social activities on the part of the adult. This can be appreciated if a successful parent or even a professional teacher of children is asked to develop a fairly simple repertory in an organism that does not already possess most of what is to be learned.

The technology of human learning has been greatly handicapped by the fact that the subject already knows most of what he has to learn and will often learn it no matter what the trainer does. The inadequacy of our description of the human learning process is masked by the virtual irrelevance of this description for most practical purposes. But in mental retardation, for example in the development of language function, this inadequacy of technique is quite apparent. Present the successful parent or teacher with a child who doesn't possess all of the ordinary skills that precede learning to talk. Require him, in other words, to build a repertory from the beginning. About all that results is a relatively feeble intensification of those activities which are successful with ordinary children -- repetition, sometimes a relatively crude use of reward, frequent general disapproval, and little else. In such a colossal failure situation it is very comforting to attribute the difficulty to the subject.

The stability of retardation with respect to a technology of behavioral change based on experience with normal humans is not surprising. But we now have a much more relevant set of concepts and techniques: those which were applied in a very deliberate way to the development and maintenance of behavior in the chimpanzee, Enos, during two orbits around the earth in a Mercury capsule. This was a repertory which takes several pages of technical terminology to describe. The concluding statement of the investigators was as follows: "The ease with which new behavior may be added to the repertoire of the chimpanzee suggests that its behavioral capacities in both breadth and complexity have not yet been approached." Those of us who are beginning to make such applications to the mentally retarded human would conclude similarly.

Social Interaction - S. Rosenberg and J. Spradlin

The social psychologist is a relative newcomer to the area of retardation. Nevertheless, he can make an important contribution to the understanding, treatment, and measurement of retardation. As stated in other parts of this report, the retarded child is almost constantly in contact with other people whether he is in a well-planned language training program or in his natural environment. In the development and evaluation of a language training program, for example, we must consider, not only the acquisition of certain responses, but also the use of these responses in dynamic interaction with others. This part of the report is concerned with the analysis of the social environment of the retarded child and the effects of this environment on his behavior.

Many of the research proposals summarized below are already an integral part of the research activities at Parsons. A number of research studies of social interaction involving retarded children have been completed at Parsons and are now available in the literature. These studies, which are cited below, contain detailed statements of the rationale, methodology, and findings of this type of social psychological study. The present report is intended to summarize only the salient features of this type of research.

Basic questions: What is the social environment of the retarded child, i.e., how do peers and adults react to the behavioral deficiencies of the child? How does the social environment of the retarded child affect his learning?

It is obvious that language skills and indeed many other skills are acquired by a child in his interactions with other children and with adults. The details of these interactions are not well known. On the other hand, considerable data have been obtained on the behavior development of the normal child, that is, the age at which language and other skills appear and the sequence in which these skills appear. What occurs, however, when a discrepancy between the chronological age and the behavior development begins to appear? That is, how do parents, other adults, siblings, peers and so on react to this discrepancy? How do these reactions of others affect this discrepancy?

In order to answer these questions, developmental studies of language must be supplemented with research concerned with the interaction of the child with other people. For example, a number of laboratory studies have been made of dyads, composed of two retarded children of known linguistic skills, and of dyads composed of a retarded child and an adult (Rosenberg, Spradlin & Mabel, 1962; Seigel, 1963; Spradlin & Rosenberg, in press). These assembly studies, which are only beginnings, have focused on the questions posed earlier, namely, the effect of the retarded person on the behavior of the other person (adult or peer) and the effects of these reactions, in turn, on the behavior of the retardate.

These initial studies on assembly are also being supplemented with a series of additional studies on situational or task variables. A variety of experimental situations can be constructed especially for the retardate in which the language required of the participants in order to obtain rewards can be systematically studied by varying the structure of the task.

A particularly interesting example of such a study is now in progress at Parsons. The experimental situation was adapted from a task first used by Mason & Hollis (1962) at the Wisconsin Primate Laboratory. A somewhat detailed description of this work at Parsons is given here to lend concreteness to what is meant by a task variable. The Parsons work is not yet available in the published literature.

The apparatus is shown in Fig. 1. It allows for the separation of the experimenter and the two children. The children are seated directly across from each other. The experimenter is shielded from the children by plywood panels. There is a translucent and an opaque shield which can be raised and lowered independently on each child's side of the apparatus. There is a one-way mirror which can be raised and lowered on the experimenter's side of the apparatus. The opaque shields allow the experimenter to place rewards in the trays in the midsection of the apparatus without being seen by the children. The translucent screens allow the child to see the trays in the midsection of the apparatus without being able to reach them. In order for the experimenter to see the children without being seen by them, the room is darkened and the midsection of the apparatus is lighted by a 20-watt fluorescent light mounted directly above the carts.

In the midsection of the equipment there are four pairs of blocks attached to metal expanders so that the movement of one cart simultaneously extends the other cart in the opposite direction. In the communication task, shields and handles are placed on the trays so that one child (the receiver) is able to see which of four trays is baited with candy (or other reinforcement), but he cannot reach the trays. The other child (the operator) can pull one of the four handles so that he can deliver reinforcement both to himself and to the receiver, but he cannot see the trays. The receiver can communicate the location of the candy, i.e., the handle which the operator must pull to deliver reinforcement to both children.

Studies conducted thus far indicate that receivers of low linguistic ability result in fewer correct responses by the operator than do receivers of high linguistic ability. Language level of the operator did not effect the numbers of correct responses. Moreover, when a normal adult functions as a receiver providing gestural cues, even profoundly retarded operators learn to respond correctly on above 90 per cent of the trials (Hollis, 1964). Finally, increase in per cent of correct responses occurs over trials, and curves look much like those found in a typical discrimination task involving individual subjects.

<ins>Applied questions:</ins> The focus on social variables and their relationships to learning by a retarded individual leads in turn to questions concerning the applications of these findings or these methods to an alteration of the natural

environment of the retarded. In the case of the institutionalized child, a number of possibilities suggest themselves, and these possibilities can be put into researchable questions. For example, what beneficial affects might accrue from judicious assignment of individuals to cottages or rooms (the assembly question)? What instructions and training can be given to aides concerning the contingencies they should establish between the child's behavior and their own (Ezell, 1960)? Is it useful to introduce a token system in which the delivery of tokens depends on the operation of some apparatus, game, etc. by two or more children, that is, a cooperative task requiring certain kinds of behavior by the participants in order for tokens to be obtained? For example, the two-person cooperative task used by Allyon and Haughton (1962) with schizophrenic patients may be adapted to retarded children.

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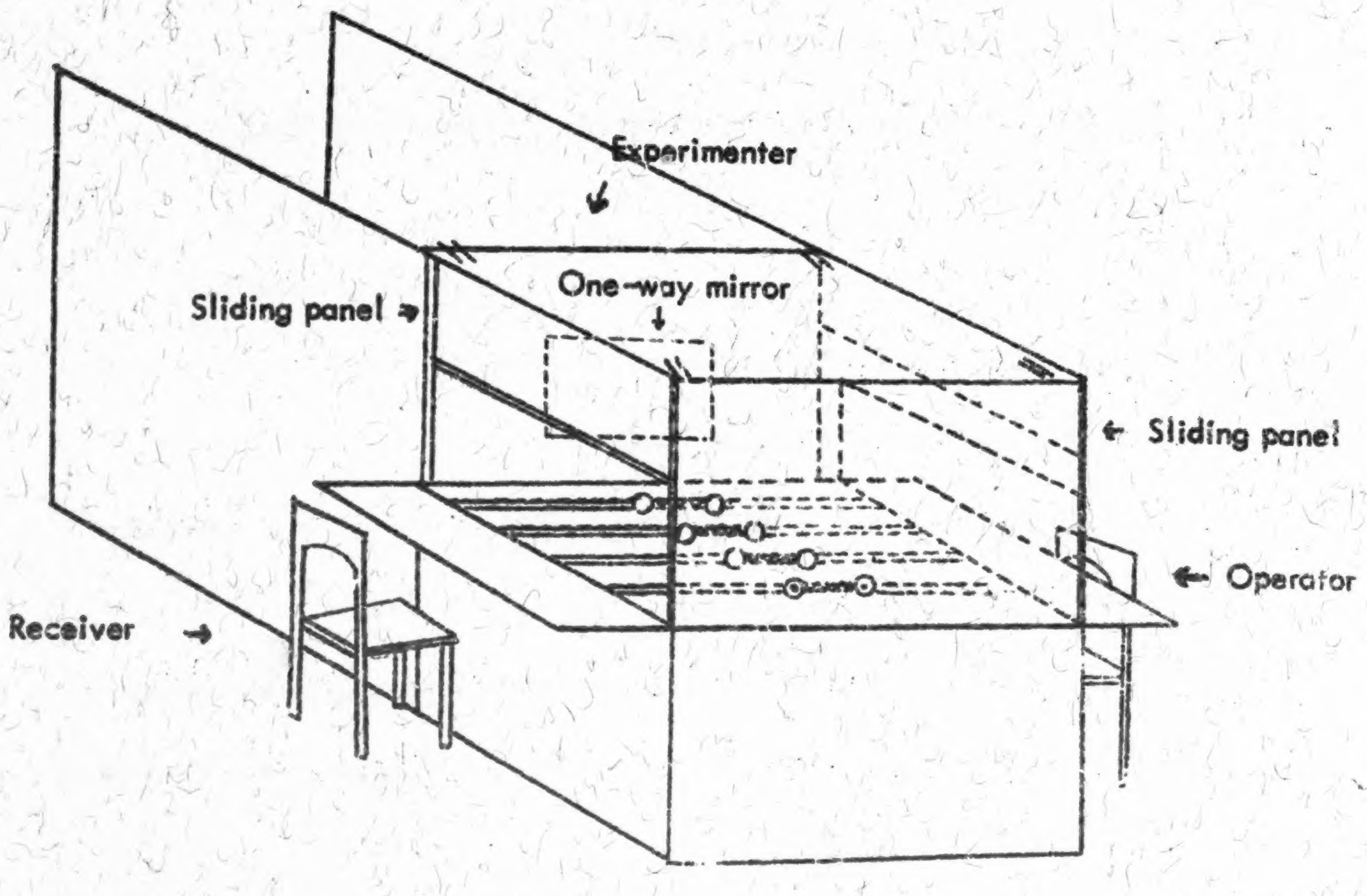
Experimenter
One-way mirror
Sliding panel
Sliding panel
Operator
Receiver

FIGURE 1. A SKETCH OF THE TWO-PERSON COMMUNICATION APPARATUS

Report Prepared by the Subcommittee on Speech Development

Committee Members: Sylvia O. Richardson
Richard L. Schiefelbusch
Gerald M. Siegel, Chairman

During the course of this conference at least two presentations dealt specifically with speech development of mentally retarded children. Schiefelbusch's paper included the statement, "In studying language development, we usually find it necessary to indicate successive stages of early functioning." In directing us to these various stages, Schiefelbusch emphasized the role of the social interactions between the child and his environment and suggested that we construct a language acquisition scheme on the basis of these interactions. He named the first stage of language acquisition "Sensory Stimulation and Smiling" and characterized it with the statement, "It is apparent, then, that long before the infant begins to use speech or to respond actively to the speech material of adults around him, he is engaging in a kind of visual, social responsiveness which is stimulating to the child and may be an important feature of his speech and language development." Thus, the beginnings of speech are traced to the first weeks of life when the child initiates smiling responses. In the three subsequent stages proposed by Schiefelbusch, level of language acquisition is always considered within a social setting, rather than in terms of the child's behavior alone.

Dr. Richardson also spoke of the problem of speech development and also emphasized the significance for the child's speech development of various "prelinguistic" experiences. According to Dr. Richardson, it is important that these early experiences confront the child with an environment that is rich in sensory stimulations and provide him with opportunities to experience and modify that environment through motor manipulation of the objects within it. Dr. Richardson, a pediatrician, thinks of these early experiences as fostering "the development of those semi-autonomous central process that can serve as imagery representatives of objects and events and which can become the referants for the spoken symbols." Though Dr. Richardson describes her approach to language learning in a vocabulary that is largely medical and neurophysiological, the program she describes may be viewed as a highly systematized program of learning experiences. The steps in this program are designed to instill in the child sequences of motor and sensory skills of increasing complexity. These, according to Richardson, are the prerequisite or antecedent conditions that are necessary for the development of speech adequacy.

Though they focussed on different facets of the child's early life, both speakers broke with traditional ways of viewing development by emphasizing behavior and experience, rather than chronological age. Traditional developmental approaches to language have traced various language functions along an ascending chronological scale. One of the correlates (or perhaps outgrowths) of the CA approach to speech development has been the tendency to regard the age at which various skills typically emerge as the age at which they should occur. This, in part, is exemplified by the wide adherence given to the concept of "readiness" in speech development. The term "readiness" is generally used to connote the physical maturation of the child; it is seldom defined, however, in terms of measurable dimensions of maturation. As a consequence, there is the danger of reasoning circularly that since the average child begins using words somewhere around his first birthday, it is at this time that he has matured to the point of speech readiness.

If developmental data derived from studies of normal children are to have any relevance for the retarded child, we must know more about "readiness" than about the chronological (or mental) age at which various skills are typically mastered. There is little doubt that certain skills and levels of maturity are prerequisite to the performance of speech. The task of the developmentalist would appear to be to identify these prerequisites and, subsequently, to devise methods for enhancing or instating these skills.

It has been the feeling of this subcommittee, therefore, that a meaningful approach to speech development is in terms of antecedent experiences and behavior sequences. Further, though such sequences necessarily occur over time, it would appear more profitable to anchor developmental descriptions to prerequisite skills than to a time sequence. It is not sufficient to know that between three and four years of age the normal child increases the length of his utterances or the accuracy of his articulations. We must discover, as well, the chain of events occuring within that interval that bear upon the advancement of these skills. There is nothing we can do to modify the CA of a child, other than to wait. We can, however, structure the child's environment, give him practice in specific skills, take him through sequences of increasingly complex tasks, and place him in a variety of interpersonal settings.

In recent years, there have been increasing efforts to implement developmental norms in speech pathology, spurred in part by the work of Templin (1957) and Templin and Darley (1960). The contributions of Templin and Darley have been particularly notable in that they have introduced some order and standardization into the process of articulation testing. Among the data reported by Templin (1957), and earlier by Poole (1934), are age norms for the mastery of the various speech sounds. Some speech correctionists have interpreted this developmental continuum of speech sound mastery as an index of complexity or difficulty; it is assumed that those sounds which are mastered first will be the easiest for the child with an articulation problem to learn. These norms do provide some direction to the planning of speech correction. It may be, however, that the developmental sequence that obtains for normal children is a poor model for the articulatory defective child. It would be useful, therefore, to augment these norms with behavioral indices of ease of correction, rather than with a simple chronology of development. In some measure, this is what Milisen (1954) has proposed in his test of stimulatibility (which test is also included in the Templin-Darley (1960) procedures).

Within the Development Subcommittee, attention was also given to the possible significance of critical or sensitive periods for the development of speech. There seem to be points in the child's development when he is particularly responsive to interventions from his environment. Disruptions of the home, serious illness, and emotional disturbances appear to be much more debilitating to speech development at certain instances than at others. Parallels can also be found in the development of such skills as walking. If such periods of differential senstivity do play some role in language acquisition, it is important to determine whether they are a function of the child's prior experience, of physiological processes that are perhaps unavailable to the experimenter, or of some combination of factors. Rheingold (1956) provided a group of six-month-old institutionalized orphans with an unusual amount of social contact ("mothering") with a female experimenter for an eight-week period. At the end of that period, when compared to a control group, the "mothered" children were more vocal and socially responsive than their controls. One year later, however, the groups differed only with respect to vocal output. In interpreting these data, Horowitz (1963) has suggested that the experiment may have been conducted at a time in the lives of these children that was critical to the development of speech, but not to the development of the other social variables observed.

It should be apparent that the notion of "critical" or "sensitive" periods is a variant of the readiness concept. Research related to this topic is clearly indicated. It is here, in particular, that many of the notions advanced by Schiefelbusch and Richardson might be tested. It would be significant to determine, for example, whether the vocal conditioning of three-month olds described by Rheingold and her colleagues (1959) and by Weisberg (1963) would be influenced by providing the children with prior social or sensorimotor experiences.

In addition to such research, there is also a need for measures with which to describe and predict the developmental sequences discussed by Schiefelbusch and Richardson. Schiefelbusch suggested that it is important to trace the social interaction of the infant with persons in his environment through the various so-called stages of development, critical and otherwise, to the point of full scale language acquisition. Dr. Richardson stressed the necessity for similar information relating the child's speech development to patterns of motor and sensory stimulation and growth. In a significant way, of course, these two areas of study necessarily converge. For the most part, the young child receives sensory and motor stimulation through the mediation of an adult and in a social situation.

An additional avenue for research would be an exploration of the interplay between specific forms of social and sensori-motor stimulation. It may be, for example, that a designated sequence of motor acts can be taught more effectively in one social complex (e.g. in the presence of peers) than in some other (in the presence of adults).

One final word concerning the relationship of speech development to remediation should be added. When, as a subcommittee, we attempted to explore the boundaries of our responsibility, we soon found ourselves dealing with the matter of speech remediation for the retarded child. Though we attempted to discipline our conversations, it was apparent to us that eventually the concerns for speech development and speech learning in the retarded child must merge. It was our feeling that, as we inquire into the process of speech development, our special concern is to specify those prerequisite skills that are fundamental to the progression of speech growth and, most important, that are amenable to environmental manipulation. It is here that the areas of speech development and speech remediation coalesce.

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Report Prepared by the Sub-committee on Treatment

Committee members: Ross Copeland
Elizabeth Drews
Bernard Schlanger
Mack Steer, Chairman

Among the more readily observable physical and behavioral problems presented by the mentally retarded are those of communication disabilities. Difficulties arise in relating mental retardation and communication problems because of the variability of biological, psychological, physical and sociological dimensions of the mentally retarded performing the communicative act.

Thus, it becomes apparent that it is impossible to focus only on the defect and inadequacy of the retardate. Rather, we come to feel that the organism fails in the environment, and the environment in turn fails the organism. The retarded and his environment are not mutually self-adjustive. We are concerned with the total personality and intellectual growth of the child, one aspect of which is communicative behavior. Therefore action must be taken in terms of planned and appropriate intervention designed to improve and facilitate the consequences of the communicative act.

The search for appropriate treatment procedures would necessarily include research in: 1. the broad dynamics of oral communication behavior; 2. the development of simplified linguistic systems; 3. the effects of the physical and the psychological environments on the communicative process; 4. the instructional and learning processes involved in the acquisition of communicative effectiveness; 5. the interpersonal dimensions of human behavior; and 6. the intra-personal dimensions of the individual.

The following are representative, but not all-inclusive, suggestions which appear to be promising and profitable areas of investigation, the results from which would contribute to the formulation of scientifically planned treatment programs. Investigations should be conducted to determine whether or not there are oral behavior patterns in infancy which are early indicators of previously unrecognized mental retardation. If early indicators in the oral behavior can be validated, research should be initiated to establish whether or not mediation of sensory enrichment can be made during infancy which will improve the probability of later language acquisition.

Treatment programs should include investigations of the systems (patterns) of sensory input for retarded children which will facilitate or improve language acquisition or information retrieval. Further investigation is required in the area of visual, auditory, and tactile discrimination ability of the retarded as these skills relate to language acquisition and communicative effectiveness.

Therapy procedures based upon deprivation and/or supplementation of selected sensory channels should be investigated. Explorations should be attempted to discover whether or not developmental data reveal the retarded child's readiness and need for a structured language training program. Manipulated response latency of mentally retarded children to psycho-physical stimuli should be investigated.

Therapy techniques based upon aural rehabilitation methods--lip reading, manual communication--should be investigated.

Standards should be established concerning minimal physical facility requirements for the maximal effectiveness of communication training programs.

Treatment techniques based upon closed circuit TV instruction should be utilized and evaluated.

Research is needed to extend and refine the application of teaching machines, not merely to traditional academic content areas, but also to the communicative processes.

Instructional procedures based upon the automatic control of communication output should be evaluated.

The possible value of electronically mediated auditory feedback as a part of a therapeutic procedure should be exhaustively analyzed.

The affects and effects of individual versus group training should be determined. Attention should be given to the importance of homogeneous versus heterogeneous pupil assemblies.

Research is needed to establish critical criteria to ensure that pupil selection is consonant with the goals of specific training programs in different settings.

Investigations should be initiated which will determine the effectiveness and impact of clinician-supervised-programs of treatment administered through a team of adjunctive or auxiliary specialists.

Equally important, the value of including parents in structured treatment programs should be investigated.

Programs of investigations should be developed to detect and evaluate the pupil-therapist interaction, the therapist-treatment interaction, the pupil-pupil interaction, and the therapist-pupil-treatment interaction.

Treatment programs should be designed to account for and incorporate those interactions which will yield maximum treatment effectiveness.

The psycho-social attributes of the clinicians selected for treatment programs should be studied and the programs of clinician training should incorporate such considerations.

Therapy techniques utilizing normal children in the role of instructors for mentally retarded children should be investigated.

Therapy procedures involving the assignment of the retarded child to the role of a teacher should be investigated. These studies should seek to evaluate the impact of this "teacher" role on the improved communicative attitude and output of the retarded "instructor". These studies should include other retarded children, other living specie and inanimate objects as the experimentally designated recipients of the instructional efforts.

In summary, experimental treatment programs based upon the most recently established research findings should be developed and evaluated for use with mentally retarded children.

Report Prepared by the Sub-committee on Measurement

Committee Members: Margaret Byrne
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Joseph Spradlin
Joseph M. Wepman

Measurement assumes that behavior can be quantified and analyzed qualitatively. Numerous other assumptions are inherent in the process. Among these are the ideas that we are, in fact, using an instrument or technique which relates to the ability of concern and that this instrument consistently performs the same function. The many other problems related to quantitative and qualitative assessment are magnified when one turns his interest to the exceptional child. Here test adaptations, often unstandardized or with inappropriate normative data, serve as the only measurement devices. The questionable appropriateness and unavailability of many tests, coupled with general paucity across all areas of exceptionally, have been continuing problems of long duration in special education.

Discussions of measurement related specifically to the area of speech and hearing of the mentally retarded do not produce markedly different conclusions. They only serve to call attention to a general need for advance and refinement of measurement tools in the entire field of speech and language.

This report will limit its scope to concern with measurement of linguistic--psycholinguistic abilities and the speech act, i.e., input-output. It is realized that this places restrictions upon the assessment of speech and language. Further research must also involve sociometric, psychometric, medical, motoric, and learning measures to allow greater advances in our informational store concerning mental retardation.

This committee recommends that attention be turned to measurement for three purposes: (1) diagnosis, (2) prediction, (3) change in development. In differential diagnosis, instruments are needed which give information on speech and language deviations from the norm, as well as deviations within the group. Predictive measures indicate the feasibility of treatment programs, and those related to change allow assessment of treatment over time. At present, there seems to be no overall picture of the measures that have been developed for these purposes. The committee suggests that a systematic attempt be undertaken to discover all such tools reported in research literature with particular attention to research grant reports.

Linguistics and psycholinguistics have provided models for the development of further language measures with the mentally retarded. Just as articulation tests have been derived from the phoneme, more attention must be paid to the word forms as a base (morphemes) and to the relationship of words in an utterance (syntax). Little is known about the "hard core" of unambiguous words necessary to serve the communication needs of the retardate in a majority of his social and vocational situations. Therefore, his speech and language progress toward this vague goal is hardly measurable. Further analyses of taped protocols of the speech of the mentally retarded seems advisable. Again the close relationship of theory, development, treatment, and measurement is most apparent. The further development of existing experimental psycholinguistic measures (such as the Illinois Test of Psycholinguistic Abilities (ITPA) and Parsons Language Sample (PLS) is encouraged. Here again, a need is recognized for instruments which are prepared to sample on a pre-linguistic level up through the optimal performance that might be expected of the mentally retarded.

Specifically on speech input, this subgroup feels that hearing testing procedures generally used with the retarded are not adequate. There is a need for further investigation of audiometric techniques which distinguish hearing loss from intellectual deficit. The committee also recommends the development of more precise measures of auditory discrimination, auditory retention, and the relationship between these aspects and the learning process.

Further analyses of the retarded child's speech output will require refined and simplified articulatory measures. Pictorial stimuli will need to be studied in order to reduce the large number of no response or inappropriate response situations. Also, measures of the motor movements in speech would seem to be useful for the planning of specific therapeutical programs. These measures will have to be based upon tasks that are meaningful to the child of retarded mental development.

In summary, it is felt that current measures of speech and language development need to be explored further through research. Additional measures are needed, but should be developed from theorized positions and in keeping with treatment programs. At present diagnostic specificity is lacking and poorly communicated. The validity of predictive measures is rarely known. Measures of change in subjects over time as a result of treatment are few in number and seldom sensitive to the within units of gross increment.

Summary of Final Discussion

The phenomena of mental retardation as a relatively stable characteristic across time was questioned. This stability of retardation, in the sense that children retarded at six years are usually retarded at nine, etc., fostered the suggestion that such stability might represent only an ineffective technology for change.

Again the relevance of animal research to research into problems of retardation was broached. The restricted environment of the experimental animal was compared with the more uncontrolled environment of the human learner. The control of environmental variables was offered as one reason for the more stable behaviors of animals. Michael contended that such stability in animal research would be the result of better control of relevant variables, whereas much human research is done with little or no such controls, therefore consequent measures of behavior are unstable.

During the conference it was suggested that future research efforts might be devoted to linguistic analyses of the speech of the mentally retarded by clinical groups. In reaction to this, several participants called attention to the history of past investigations of clinical types and concluded that analysis on this basis has not proven particularly fruitful.

At this point there was injected into the discussion the ideas of success and failure as they relate to animal and human research. Michael was asked at what point with the animal do you concede you cannot achieve success. He commented that those who do such animal research do not focus on failure of the animal, but would rather conclude that, with the ineffective technique or program used at the present time, we are unable to produce this particular behavior. The group felt that with the mentally retarded too much of our attention has been paid to the failures of the learner rather than to the ineffectiveness or inappropriateness of our treatment programs. This point of view could very well have important implications for future research with, and education of, mentally retarded populations. It was stated further that negative results ought to be reported, that this knowledge can guide subsequent research; but such statements should not be accepted necessarily as evidence of incapacity of the organism.

Reference was made to the fact that not enough is known about the receptive or expressive vocabulary that would allow the borderline or mildly retarded person to function adequately in society. It was suggested that further effort be made to identify such a basic or hard core vocabulary and then to program in these words throughout the child's school experiences. It was conjectured that a relatively small vocabulary might account for a very high percentage of the communicative efforts in retarded populations. Several participants cautioned that great attention must be paid to the stimuli, mode of presentation, and social setting used to elicit such a vocabulary.

The group's attention then turned to a discussion of possible critical periods for language learning in the retarded child's development. The relationship of such developmental concepts as language age, listening age, and emotional age to mental retardation is largely unexplored. Here the work of

William Hardy at Johns Hopkins on the development of usable conceptual hearing in children was mentioned. This line of thought was considered to be similar to "readiness", i.e., does the child present a readiness to develop further in a particular area?

The current interest in teaching machines and programmed learning materials was mentioned as relevant to language learning. The research discussed in this area pertained to work with auditorally impaired and aphasics. The need to develop further investigations of such programs with the mentally retarded was specified.